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Eugene B. Power

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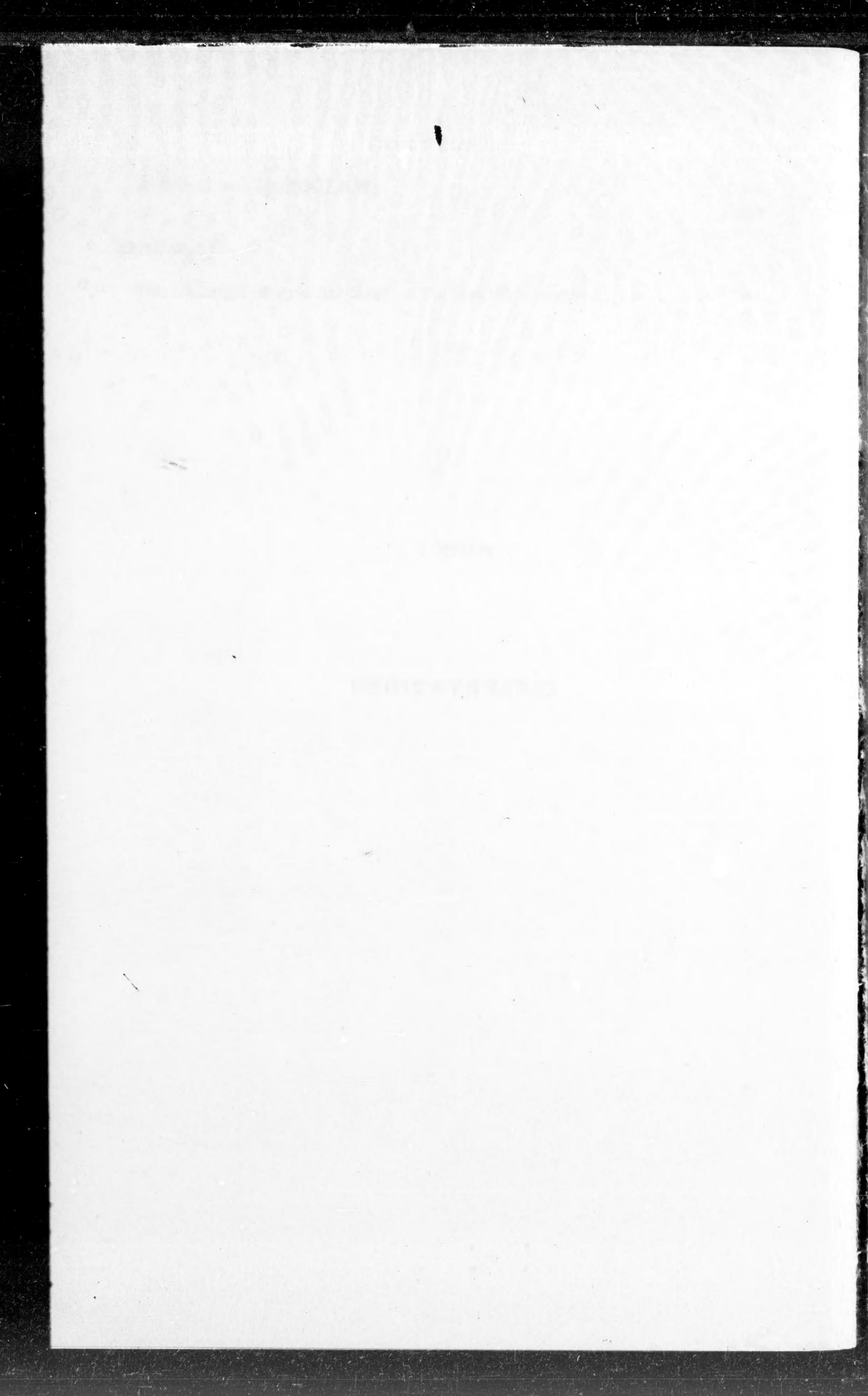
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PART I

DISSERTATIONS



AGRICULTURAL AND BIOLOGICAL CHEMISTRY

BIOCHEMICAL STUDIES OF POLLEN FROM ZEA MAYS

(Publication No. 1565)*

Carl Temple Redemann, Ph.D.
Michigan State College, 1949

Investigation of the ethyl ether extractible material from the pollen of Zea Mays, varieties Golden Cross Bantam and Ohio M-15, has shown that there exist more than one ether soluble plant growth regulator in corn pollen. Most of these ether soluble growth regulators are neutral substances; in this respect they differ from auxin a, auxin b, and heteroauxin.

One of the growth regulators, a nitrogenous primary alcohol, has the empirical formula $C_6H_7NO_2$ and forms a p-phenylzaboenzoate melting at 203-204°. Analytical data, together with color tests, suggest that this alcohol is 2-hydroxy-5-hydroxymethyl pyridine, which has not yet been synthesized.

The bright yellow pigment extracted from corn pollen by ethyl ether was isolated and identified as quercetin. This observation was confirmed by conversion of the pigment to the pentacetate and also to the 3,7,3',4'-tetramethyl ether.

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ANTHROPOLOGY

ABORIGINAL URN BURIAL IN THE SOUTHEASTERN UNITED STATES

(Publication No. 1541)*

Catherine Josephine McCann, Ph.D.
University of Pennsylvania, 1947

The purpose of this paper is to trace the origin, antiquity, and diffusion of urn burial in the southeastern United States. Urn burial is defined (for the purposes of this paper) as the intentional inclosing of human remains in pottery vessels. Two types of urn burial are distinguished: one in which the bones are placed in an upright vessel, and one in which the bones are covered by an inverted vessel. In either case the skeleton may be cremated or uncremated, disarticulated or in anatomical order. The practice of inverting a vessel over the skull only of an extended skeleton is excluded, since the circumstances of its occurrence seem to indicate that it is not a part of the same cultural complex.

Southeastern urn burial is most common in southeastern Georgia, the northwest coast of Florida, and southern and central Alabama. It has also been reported from central Georgia and from the coastal plain of North and South Carolina. It is extremely rare in the lower Mississippi valley.

Urn burial is a rather late trait in the Southeast, occurring only in the Temple Mound periods and continuing into historic times. Its earliest appearance seems to be on the Georgia coast, in the early part of the Savannah period.

Urn burial is not characteristic of any other area of North America except Mexico, the southwestern United States, and the West Indies. There is a large spacial gap in distribution between the urn burial of Mexico and the Southwest and that of the Southeast, so it is concluded that southeastern urn burial was not a result of diffusion from Mexico or the southwestern United States. The occurrence of urn burial in similar forms in the nearby West Indies suggests that it may have originated there.

It is concluded, therefore,

1. That urn burial was probably introduced into the Southeast from the West Indies, but that there is also a possibility that it arose independently in the Southeast.
2. That if it came from the West Indies, it was introduced into

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the mainland at some point on the Georgia coast at a comparatively late (though not immediately prehistoric) date.

3. That the trait was diffused westward and northward, and persisted into early historic times in Alabama, Florida, and here and there in the peripheral areas.

4. That the concept of urn burial was diffused alone and not as part of a complex of burial customs or pottery traits.

BACTERIOLOGY

THE EFFECT OF SERUM AND OTHER SUBSTANCES ON THE ACTIVITY OF THE POLYMORPHONUCLEAR LEUKOCYTES OF THE GUINEA PIG

(Publication No. 1519)*

Donald Joseph Merchant, Ph. D.
University of Michigan, 1950

An attempt was made to determine the effect of serum on the activity of polymorphonuclear leukocytes, aside from its opsonic action, and to discover the means by which its influence was exerted. An effort was also made to ascertain the role of ascorbic acid and histamine in motility and other activities of white blood cells. Effects on the other activities were correlated with effects on phagocytosis.

The technique employed was to make darkfield examinations of living leukocytes in a moist slide preparation at 37° C. Such a procedure made possible the simultaneous observation of opacity of the cytoplasm, brownian motion of the granules, pseudopod formation, amoeboid motion, diameter of the cells, degenerative changes, adhesiveness to solid surfaces, agglutinating tendencies, and phagocytosis. In the past, observations had been limited to (a) motility, including chemotaxis or directional motion, (b) phagocytosis, or (c) a combination of (a) and (b). The net result of the technique presented here was a more complete picture of leukocyte activity.

Application of this method to the problems mentioned above revealed that homologous (species) serum was essential for normal activity. Replacement of the serum with a balanced salt solution was unsuccessful. Adjustment of the viscosity of these solutions to that of serum by the addition of gum arabic also failed to provide the necessary conditions for normal leukocyte activity. The presence or absence of complement played no role.

Sera of the rabbit, rat, sheep, chicken, and human contained substances which were toxic for the polymorphonuclear leukocytes of the guinea pig. The toxicity was evidenced by a curtailment of pseudopod formation, motility, and phagocytosis. Also an increase in the viscosity of the cytoplasm, appearance of degenerative changes, loss of adhesiveness, and a tendency to clump were noted in leukocytes treated with "foreign" sera. The toxic action was

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partially lost when the sera were heated at 56° C for 30 minutes, and partially destroyed by treatment with a heavy suspension of guinea pig leukocytes. The toxic effects noted were irreversible, but the toxicity was rather easily lost upon dilution. No evidence of toxic action of the serum of one guinea pig on the leukocytes of another was noted.

A definite level of ascorbic acid in the donor animals was found to be necessary for the activity of the leukocytes they produced. Increased amounts of ascorbic acid above this level did not increase activity. The addition of histamine, in quantities larger than normally found in the blood, failed to increase leukocyte functions.

It was concluded that the role of serum in supporting leukocyte activity cannot be explained on the basis of the presence or absence of any single component or group of components. Furthermore it was shown that serum affects other activities of the leukocytes besides phagocytosis.

The presence of toxic substances in "foreign" sera were demonstrated, and on the basis of the data presented it was postulated that two toxic fractions might be present. Further experiments brought forth evidence that the toxic substances may act on the cell surface. The significance of such findings for serum therapy was discussed.

On the strength of the experiments presented and certain reports in the literature it was postulated that ascorbic acid was necessary for the initiation of motility and phagocytosis, and was possibly associated with the chemistry of the cell wall.

The quantitative estimation of phagocytosis, using the warm stage-darkfield technique, suggested a wider application of such a method in phagocytosis studies, since with this method the cells are observed under more normal conditions and a variety of observations can be made simultaneously.

BOTANY

DEVELOPMENTAL AND EXPERIMENTAL MORPHOLOGY
OF HEVEA BRASILIENSIS MUELL. ARG.

(Publication No. 1522)*

Thomas J. Muzik, Ph. D.
University of Michigan, 1950

Form and structure of plants are determined by external as well as internal conditions. The ability of the plant to regenerate excised tissues and organs is very important. Many aspects of the morphology and regeneration of Hevea brasiliensis had not been previously investigated.

Studies were made of the histogenesis of the stem apex, the development of the primary laticiferous tissue, structure of the embryo, the relationship between the latex systems of young and old trees, the development of fruit, seed and embryo and root structure.

Experimental investigations included embryo and endosperm culture on agar nutrient media and treatments of roots and stems to induce the formation of roots or buds and the application of hormone to stimulate bark renewal.

The shoot apex has a two-layered tunica which forms the epidermis of stem and leaves and the outer cortex. The pith, stele and inner cortex and most of the primary laticiferous tissue arise from the corpus. The latex vessels in the pith are formed by the laticiferation of parenchyma cells and subsequent resorption of the end walls. There is no appreciable increase in length of these vessels. Vascularization is closely associated with the foliar organs and differentiation is both acropetal and basipetal.

The embryo contains six vascular bundles and a well developed latex system. A two-layered tunica is present before germination.

Seventy-five per cent of the growth of the seedling takes place at night. Periods of growth alternate with periods of absolute standstill. It is suggested that a hormone relationship is responsible for this fluctuation, which is correlated with leaf formation and expansion in the shoot apex. Correlation between the rooting of cuttings and the periodic growth is cited as additional evidence.

Maximum fruit size is attained in ten weeks after fertilization, maximum seed size in twelve weeks and maximum embryo size in fourteen weeks.

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Young budlings do not exhibit the same relative flow of latex as do the mature trees.

Complete embryos grow well on agar nutrient media, but the axes alone failed to grow. Endosperm in culture often turned green and increased in volume. Regeneration which occurred in nature is described.

Roots on cotyledons originate near a vascular bundle and often show negative geotropism. Buds were formed on two cotyledons, both cultured with half an endosperm.

Roots were generally very unregenerative but young roots sometimes formed new roots. No buds were ever produced.

Branch cuttings failed to root. No seasonal variation occurred nor did growth hormones or other treatments aid rooting. Branches could be rooted by marcottage.

Young seedlings did not regenerate adventitious buds but older plants did so freely and were stimulated by grafting.

The rate of bark renewal is most rapid in the first month after excision. It is increased by the application of growth hormone.

The method described whereby three or more plants may be obtained from a single seed is of great importance for studies of the relationship between stock and scion, since it makes possible the large scale multiplication of desirable stocks.

C H E M I S T R Y

PART ONE

STUDIES ON THE SYNTHESIS OF TETRAHYDROCANNABINOL HOMOLOGS

PART TWO

CONTRIBUTIONS TO THE MULTIPLANAR ISOMERISM OF CYCLOHEXANES

(Publication No. 1545)*

Theodore Edwin Bockstahler, Ph. D.
University of Illinois, 1949

I. Studies on the Synthesis of Tetrahydrocannabinol Homologs

Introduction

Numerous investigations have been made of tetrahydrocannabinol, the physiological constituent of marihuana, but none has conclusively proven the structure of the naturally occurring material.

In the most recently attempted synthesis of tetrahydrocannabinol Adams (1) found that the intermediate reaction of isoprene and 2,6-dihydroxy-4-methylcinnamic acid was unsatisfactory. This thesis reports studies of this type of diene addition and of several pertinent reactions.

Discussion of Results

In order to study the addition of isoprene to *o*-hydroxycinnamic acids, methyl 2,6-dihydroxycinnamate was prepared. The method was that used by Adams (1) with minor changes. Resorcinol dimethyl ether was formylated between the methoxyl groups by butyllithium and N-methylformanilide and the resulting dimethoxybenzaldehyde cleaved to γ resorcylaldehyde by aluminum bromide in carbon bisulfide. This aldehyde was condensed with malonic acid in the presence of pyridine and aniline, and the resulting 3-carboxy-5-hydroxycoumarin was decarboxylated to 5-hydroxycoumarin by aqueous sodium bisulfite. 5-Hydroxycoumarin was then converted to 2,6-dihydroxycinnamic acid by aqueous sodium sulfite and the acid was esterified with diazomethane.

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The above reagents were also successfully applied in the conversion of salicylaldehyde to methyl *o*-coumarate. Acetals of resorcinol were prepared by the use of ethyl vinyl ether and dihydropyran (2) in an attempt to produce γ -resorcylaldehyde in one step via the lithium derivative. Only small yields of the aldehyde resulted due to extreme sensitivity of the acetal-aldehydes to acid and immediate resinification of the products.

In test reactions, methyl *o*-coumarate added 2,3-dimethyl-1,3-butadiene and isoprene. The product was always a tetrahydrodibenzopyrone. Isoprene did not add to 2,6-dihydroxycinnamic acid or its methyl ester, and resins resulted in both cases. The dihydropyran acetal of methyl *o*-coumarate was then prepared; it added isoprene satisfactorily and cyclized just as did the unblocked ester. Neither the dihydropyran nor ethyl vinyl ether acetals of methyl 2,6-dihydroxycinnamate added isoprene but cyclized to 5-hydroxycoumarin instead. These acetals were too unstable to heat to aid in the desired diene reaction.

A trace of aniline was found to be a superior catalyst for condensation of the following hydroxybenzaldehydes with malonic acid: *o*-hydroxy-, *m*-hydroxy-, *p*-hydroxy-, 4-hydroxy-3-methoxy-, 2,3-dihydroxy-, 3,4-dihydroxy-, and 2,6-dihydroxybenzaldehyde. Yields were frequently three times as high as those achieved by piperidine.

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II. Contributions to the Multiplanar Isomerism of Cyclohexanes

Introduction

In 1942 Desai (1) reported the isolation of two isomers of 3-methylcyclohexane-1,1-dicarboxylic acid. He explained their existence by assumption of a non-planar cyclohexane ring and claimed the isolation of boat and chair forms.

Desai prepared his isomers by separating 3-methylcyclohexane-1-carboxy-1-acetic acid into its non-optical isomers and then subjecting each isomer to an identical series of reactions. The results of a repetition of Desai's procedures are reported.

Discussion of Results

3-Methylcyclohexane-1-carboxy-1-acetic acid was prepared as described by Desai. Ethyl cyanoacetate was condensed with 3-methylcyclohexanone, potassium cyanide was added to the resulting cyclohexylidene, and the adduct then hydrolyzed. Separation of the 1-carboxy-1-acetic acid into two isomers was successful, and the melting points agreed closely with those of Desai.

The 164.5° isomer was brominated in the alpha position only with difficulty. No attempts were made with the 108° isomer since only small quantities were purified. Formation of the glycollic acid with sodium carbonate solution failed, as did attempts via the β-lactone. Neutralization of the bromoacid with barium hydroxide and oxidation by potassium permanganate gave only small amounts of oxalic acid instead of the desired 1,1-dicarboxylic acid.

It was concluded that the procedures as described by Desai could not be repeated and that a new approach was necessary to successfully prepare the desired malonic acids.

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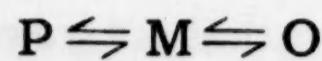
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**A KINETIC AND EQUILIBRIUM STUDY
OF XYLENE REARRANGEMENTS**

(Publication No. 1570)*

Raymond T. Vaughn, Ph. D.
University of Missouri, 1948

Using aluminum bromide and anhydrous hydrogen bromide as a catalyst, the rate of rearrangement of the isomeric xylenes was measured. An analysis of the kinetic data indicates that: (1) The rate was first order with respect to xylene and directly proportional to the quantity of HBr added. (2) The p- and o-isomer rearrange rapidly to the meta form; the reaction P ⇌ O is very slow if occurring at all. The reaction is believed to be



Since the rate is directly proportional to the concentration of HBr, with no rearrangement occurring in the absence of HBr, the

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formation of the highly ionized acid HalBr_4 was postulated. The catalytic properties were attributed to the effect of the reactive proton upon the benzene ring.

Upon the basis of a reactive proton and the catinoid mechanism of substitution, a theory of catalytic rearrangement in the Friedel Crafts reaction was proposed. The catalytic proton is directed to certain positions in the ring by the substituents already present. Having entered the ring, the proton produces a redistribution of charges at the carbon atoms. An increase in electron density permits substitution by electron deficient groups such as the carbonium ion. Should an alkyl group be attached to a carbon whose electron density is diminished, a decrease in bond strength will occur with possible dealkylation. Since the meta and ortho-para carbons alternate, an opposite effect would be expected at alternate carbon atoms. Consequently, alkylation and dealkylation would occur on adjacent carbons. The net effect would be the migration of an alkyl group to an adjacent carbon. The rearrangement of the ortho- and para-isomer to the meta form as shown experimentally tends to confirm such a mechanism. The thermodynamic quantities for the rearrangement of the isomeric xylenes with equivalent molar concentrations of reactant and catalyst are as follows:

Reaction	ΔH^\ddagger (cal.)	ΔS^\ddagger (cal./deg.)
$P \rightleftharpoons M$	15,200	-26.4
$O \rightleftharpoons M$	10,500	-41.3
$M \rightleftharpoons O + P$	20,400	-13.6

The suggested activated complex for rearrangement is based on dealkylation as the rate determining step. A dealkylated xylene molecule with the catalytic proton in the ring is considered the activated complex. Complex formation between the hydrocarbon and catalyst is considered an accompanying process with possibly some effect on the rate of rearrangement.

The equilibrium composition of the isomeric xylenes was measured at 30° and 50° C. The equilibrium values at 50° C. are: ortho, 17.8 ± 0.5 per cent; meta, 64.7 ± 1.0 per cent and para, 17.6 ± 1.0 per cent. At 30° C., the equilibrium composition is: ortho, 14.5 ± 0.5 per cent; meta, 67.3 ± 1.0 per cent and para, 18.2 ± 1.0 per cent. The thermodynamic constants for the rearrangement reactions were calculated from the equilibrium values.

The isomeric xylene mixtures were analyzed quantitatively by means of ultra-violet absorption spectra using a Beckman quartz spectrophotometer. A working chart was prepared by measuring the absorption of synthetic samples, covering the entire composition range. The synthetic samples were prepared from standard

samples of hydrocarbons obtained from the National Bureau of Standards.

A method was developed for the analysis of three component mixtures with overlapping absorption bands and applied to xylene mixtures with an accuracy of ± 0.5 per cent. By fixing the concentration of one component with the total concentration constant, and varying the concentration of the two remaining, a straight line relationship is expected between the difference in optical densities at two wavelengths, λ_1 and λ_2 , and the composition of the mixture. All lines representing fixed quantities of one component are parallel. Similarly, lines representing constant concentrations of the second component will be parallel and have a slope different from that of the first if their extinction coefficients at two wavelengths differ. A difference of optical densities at wavelengths λ_3 and λ_4 fixes the points of intersection of these two groups of parallel lines, thus giving the composition of the mixture. The above relationships are shown graphically for the ternary system o-, m - and p-xylene, which served as a working chart for the analysis of isomeric xylene mixtures. For a working chart, as described above, to be sensitive to all components of a mixture, strong bands of one component must coincide with weak bands of the other components. Secondly, the wavelengths selected should provide a maximum difference in absorption for a single component. Although the isomeric xylenes do not fulfill entirely the conditions required for analysis of mixtures with overlapping absorption bands, the method described was applied to xylene mixtures with an accuracy believed to be equal to that of any spectrophotometric method described in the literature for the analysis of mixtures.

ECONOMICS

A STUDY OF THE RECESSION OF 1937

(Publication No. 1513)*

Douglas A. Hayes, Ph.D.
University of Michigan, 1950

This study represents an empirical investigation of business developments during 1936-38 with the objective of ascertaining the factors which were responsible for the sharp set-back in business in the middle of 1937. It does not attempt to develop a general theory of business cycles or to examine the validity of existing general theoretical structures. However, at certain points the relevance of certain aspects of specific business cycle theories to the 1937 decline are discussed.

The relationship of dynamic developments within the economy to the course of business in 1936-38 are considered under the following broadly defined headings:

1. Costs, prices, and inventories.
2. The supply of capital.
3. The demand for capital.
4. Consumption and deficit financing.

In order to suggest the causes of the recession of 1937 it was found necessary to trace and explain the pattern of business activity from the beginning of 1936, and in some instances references to the consequences of economic events in the twenties and early thirties were required.

The results tend to indicate that the recession of 1937 was due to the following factors:

1. Excessive inventory accumulation in the first part of 1937 in anticipation of rising costs, prices, and consumer demand.
2. The unfavorable status of long-term expectations of business enterprise.
3. A high propensity for liquidity on the part of business and consumers.
4. An inadequate supply of "risk" capital.
5. The failure of residential construction to recover to any appreciable extent.

* Microfilm copy of complete manuscript of 256 pages, \$3.20.
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6. A decline in the demand for consumer durables in the middle of 1937.

Certain conclusions of a general nature were suggested in the light of the 1937 decline. These are:

1. Long-term expectations are not necessarily a function of the existing trend of business activity.
2. Rising costs and prices might have widely divergent effects on private investment in various areas.
3. The impact of an extraordinarily severe depression on business and consumer propensities might tend to restrict a subsequent recovery.
4. Monetary measures aimed at reducing the cost of capital to business enterprise do not have a uniform impression on all sectors of the capital markets.
5. Public policies designed to restore confidence in the long-term outlook are of utmost importance when long-term expectations are unfavorable.

THE ECONOMICS OF RISK IN THE MARKETING OF SOYBEANS AND SOYBEAN PRODUCTS

(Publication No. 1548)*

Thomas Applegate Hieronymus, Ph. D.
University of Illinois, 1949

Theory of Risk

Risk is the possibility that the outcome of an economic venture may not resolve itself into the anticipated or desired form. Uncertainty is a lack of knowledge of the result that may be anticipated from the combination of any set of known or unknown circumstances. Uncertainty arises from a lack of knowledge of the general conditions surrounding a venture, on the one hand, and from chance behavior on the other. Risk is a consequence of uncertainty.

While individuals do not react similarly to risks and not all individuals behave rationally, it can be concluded that there is a large group of men whose reaction to risk is rational. Risk is a disutility, and so a reward must be paid for risk bearing in proportion to the degree of risk. This reward, or the cost of risk, is paid out of the extra product of the agents engaged in risky ventures. These agents are more productive than those employed in

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non-risky ventures because the amount of each is reduced below the level that would be expected under the normal workings of competition.

The economy as a whole continually strives for measures which serve to reduce the total uncertainty. The methods for aggregate risk reduction are: avoidance of risky ventures, elimination of physical hazards, combination, and specialization. The individual entrepreneur may elect to assume all of the risk, to shift part of the risk by insurance, by hedging on futures markets, by contracting out, by arranging variable payment for the agent he uses, or by forward sale.

Objectives

The study was limited to the market, or price, risk aspects of risk in general. The theory of risk was examined in the light of the actual situation in the marketing of soybeans. The specific objectives were: (1) to determine the absolute amount of market risk; (2) to determine the original incidence of this risk; (3) to determine the final incidence of the market risk; (4) to determine the methods by which risk is shifted; (5) to assess the cost of shifting risk; and (6) to review critically the risk shifting devices in use and to suggest changes in marketing methods that might improve the market for risk.

Method

Comparatively little of the data required is regularly collected. It was necessary to go to trade sources to collect basic data. Information on soybean marketing activities for the crop year 1947-48 was obtained from country elevators, carlot dealers, grain commission firms, terminal elevators, grain merchandisers, soybean processors, brokers in soybean oil and soybean meal, feed jobbers and manufacturers, and users of soybean oil.

Results

The final incidence of risks, in per cent of total risk, was as follows:

Farmers	32.64	Meal retailers, exporters, and food manufacturers	.85
Country elevators	4.10	Meal resellers	3.51
Intermediaries	.15	Feed manufacturers	21.80
Processors	8.16	Hedged in soybean futures	2.58
Oil speculators	1.42	Hedged in oil futures	3.29
Oil users	24.03	Hedged in meal futures	.35

The final incidence of risk varied considerably from the original incidence. Country grain elevators, the grain trade, the soybean processors tended to shift most of the risks inherent

in the performance of their functions forward to other classes of firms, feed jobbers, feed manufacturers, and oil users in particular. The primary method of shifting risk used was that of forward sale of soybeans, soybean oil, and soybean meal. Futures markets were used very little. The amounts of risk shifted or carried by the different classes of firms varied according to their risk-bearing capacity.

The cost of getting risks assumed was approximately 33.5 cents per bushel on all of the soybeans marketed in Illinois from the 1947 crop. This is the amount of the risk premium.

Detailed examination of forward sales indicates that it is a poor method of risk shifting and that conceptually future markets afford a more efficient and less costly method. Accordingly the principal suggestions dealt with the development of more adequate futures markets for soybeans, soybean oil, and soybean meal.

THE RISE OF AN IRON COMMUNITY: AN ECONOMIC
HISTORY OF LEBANON COUNTY, PENNSYLVANIA,
FROM 1740 TO 1865

(Publication No. 1540)*

Frederic K. Miller, Ph.D.
University of Pennsylvania, 1948

This dissertation deals with the economic evolution of the area known as Lebanon County, Pennsylvania, from an agricultural region to one in which the production of iron became increasingly important. The boundaries of this area north and south, the Blue and South Mountains respectively, are natural boundaries, while to the east and west the boundaries are largely economic.

Immigrants started to enter this Valley during the third decade of the eighteenth century. Most of them were of German origin, though some Scotch-Irish, French, and English immigrants also came. The Germans, especially, seemed to find here in Pennsylvania a replica of their homeland. They were a thrifty, industrious, and religious people who soon developed agricultural practices that were, and remain, highly productive.

From the beginning farming was of major economic importance.

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German farmers have always maintained a fine reputation. General farming was universally practiced in the years before the Civil War, with a major interest in the raising of wheat. Trade in agricultural products was only a local trade for many years, but after the Union Canal was completed in 1827 farmers began to send much of their produce to the Philadelphia markets. This trend was greatly stimulated by the building of the Lebanon Valley Railroad in the fifties. Farming was also aided in these decades before the Civil War by an unusual growth in urban population and the rise of an industrial society. The agricultural fair, beginning in the late fifties, likewise proved to be very beneficial to the farmers of this county.

However important agriculture was to Lebanon County, the rise of an iron industry was an even greater determining factor in its economy. Showing a slow but steady growth until about 1840, both the mining of iron ore and the fabricating of iron products came to the fore rapidly and dramatically during the period 1840-1865.

Beginning in the 1740's the Grubb family and their lessees opened and developed the large deposits of iron ore at Cornwall. They also erected and operated a number of charcoal furnaces. For a hundred years the smelting of iron was done entirely with charcoal, and the industry was characterized by small charcoal furnaces erected usually on large "planations," organized rural communities, close to the source of fuel.

The magic name of Coleman entered the industrial history of Lebanon County in 1785 when Robert Coleman began to purchase the Grubb interests. This family continued to exert a major influence in the iron industry both at Cornwall and later at Lebanon until the twentieth century.

One important phase of the industrial revolution was the introduction and rapid growth of the use of steam power instead of water power. This development, occurring in the 1840's, is especially noteworthy in the iron industry of Lebanon County, for it was accompanied by the change in fuel from charcoal to anthracite coal and by the development of the city of Lebanon as an iron center.

During the two decades preceding the Civil War agriculture lost ground rapidly to iron as the chief factor affecting the economy of the county. This rapid development brought many drastic changes in its wake. Rolling mills, car manufactories, and steel mills were built in increasing numbers. The city of Lebanon rapidly assumed a leading role in the iron industry of the state. The county as an economic unit came to depend upon iron and steel rather than upon agriculture for its financial well-being. In this transformation it is necessary once again to emphasize the part played by the several branches of the Coleman family both in the city of Lebanon and at Cornwall.

Thus in a period of less than one hundred and fifty years the political and economic area of Lebanon County was transformed from an agricultural region to an industrial one, from a region that was noted for its wheat, barns, and horses, to one that was proud of its furnaces and mills. While the twentieth century was to witness other important developments which lie outside the scope of this research, during the nineteenth century iron was "king" and the economic area of Lebanon County was an "iron community."

EDUCATION

AGE CHANGES IN MEASURES OF EYE-MOVEMENTS IN SILENT READING

(Publication No. 1502)*

Francis A. Ballantine, Ph.D.
University of Michigan, 1950

This is a cross-sectional study of age changes in the eye-movements in silent reading of typical children while reading easy and graded material. The purposes of this study are (1) to obtain growth curves for various eye-movement measures, (2) to discover at what age growth for the measures levels off and is no longer significant, and (3) to compare the growth curves for the easy and graded passages.

The subjects of the experiment were 120 pupils representing grades two, four, six, eight, ten, and twelve. They were average pupils. The grade-groups were approximately two years apart in developmental level. All pupils except those in grade two read two test passages, an easy passage and a graded passage. The easy passage was the second-grade passage. The passages were equated for difficulty by means of one or more of the following formulas: Lorge, Yoakum, Dale and Chall, and Flesch.

The Ophthalmograph was used to record the eye-movements of each subject. Before reading the test selections each subject read practice selections of corresponding difficulty. Four eye-movement measures were plotted from the film. These were (1) rate of reading in ems per minute, (2) number of fixations per em, (3) number of regressions per em, and (4) number of refixations per line. In addition, a comprehension score was obtained. The comprehension tests were standardized in order to be of comparable difficulty. In order to attain the purposes set forth, mean values were computed for each grade-group on each passage. Growth curves were plotted from these means. The significance of the differences between mean scores for different grade-groups on the easy and graded passages as well as of the difference between inter-passage means was tested by means of the t test.

The following statements are a summary of the more important findings of this study.

1. The growth curves for fixation and regression frequency and rate of reading revealed rapid growth from grades two to four,

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a leveling off between grades four and six, a reacceleration between grades six and eight, and, finally, a leveling off after grade eight with little growth evident after grade ten.

2. Tests for significance of the change between grades substantiated almost wholly the over-all picture obtained from inspection of the growth curves. The differences between the means for fixation and regression frequency and rate of reading were significant at the 1 per cent level between grades two and four and grades six and eight on both passages. In addition, a significant difference at the 5 per cent level was found for rate of reading between grades eight and twelve on the graded passages. Significant differences were not proved for either passage between grades four and six or between grades ten and twelve for any of the above-mentioned measures.

From the specific findings of this study, the following conclusions may be drawn:

1. Significant growth in eye-movement efficiency in silent reading continues to grade eight or ten.
2. After grade eight or ten, growth in eye-movement efficiency definitely levels off and is no longer significant.
3. The difficulty of the material does not significantly affect the pattern or rate of growth in measures of the eye-movements in reading.

A PERSONAL GUIDE FOR WOMEN STUDENTS IN ELEMENTARY EDUCATION

(Publication No. 1567)*

Margaretta M. Bone, Ed. D.
New York University, 1949

The Problem

The problem was to write a book for women students who are concerned with the elementary curriculum that would give both a technically true and inspiring presentation of the personal prerequisites (native and acquired), the education (specific and general), the types of preparations, and the variety of experience both necessary and desirable for a woman student wishing to become an effective elementary teacher.

* Microfilm copy of complete manuscript of 230 pages, \$2.88.
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Background of the Problem

The author has noticed a dearth of easy, non-technical professional reading material that can be recommended for students to read on their own without necessitating further encouragement or prodding. A book written in a personal, easy to read, intimate style will provide one means of creating or keeping alive enthusiasm for teaching, and of alleviating anxiety or concern regarding student and teaching problems.

Procedure

In order to discover and study the common needs of the women students in the elementary curriculum a group of students in elementary education at the Mansfield State Teachers College was interviewed. Secondly, a group of faculty members who teach or advise students of elementary education at Mansfield State Teachers College was interviewed to find the problems that arise or are brought to their attention as they work with students. Thirdly, a group of teachers in service who graduated from Mansfield State Teachers College was interviewed to get an expression from them regarding what they felt was good, weak, or lacking in their preparation.

By an analysis of the eighty-six reports from the three groups interviewed one hundred twenty-three categories were determined that would need consideration for inclusion in the concluding book. Using the list of categories as a guide, literature on education and allied fields was read and assimilated.

With the material of interviews and reading at hand and in mind, a book was written to serve as a personal guide for women students during their years of training in the elementary curriculum.

After the book was tentatively completed three faculty members and twelve students who were not acquainted with the study were asked to read the book. They were asked to write their reactions to it from specific points of view. In the light of all the criticisms and suggestions revision was made as reactions indicated the need until the resultant book seemed satisfactory.

Conclusion

The following statement from the foreword illustrates the style and summarizes the purpose of the book for students entitled "If You Choose To Teach."

"If you are thinking of becoming, or are already, a woman student in the elementary curriculum at a teachers' college then this book is for you. It tries to show you how girls prepare to be teachers for the elementary school. It is hoped that you will try to visualize yourself in the role of a developing teacher. It is also hoped that the book will suggest to you numerous ways that you can help yourself to become a worthwhile member of an inspiring profession.

For the purpose of gathering material to interest and help you, fifty-two students in the elementary curriculum (12 freshmen, 13 sophomores, 17 juniors, and 10 seniors) were interviewed personally by the author. The numerous quotations in the book, unless otherwise indicated, are actual statements made by individual girls that were among the group interviewed. Perhaps you have said some of the same things. We sincerely hope that you will find some kindred souls in the book and some welcome friendly advice. Furthermore if you are not interested and at times amused, the whole point of the book has been missed."

THE RELATIVE EFFECTIVENESS OF INCIDENTAL GUIDANCE
AND A PROGRAM OF INTENSIFIED EDUCATIONAL AND
VOCATIONAL GUIDANCE ON THE ADJUSTMENT AND
VOCATIONAL SUCCESS OF A CLASS OF FLINT,
MICHIGAN, HIGH SCHOOL STUDENTS FIVE YEARS
AFTER THE GRADUATION OF THE CLASS

(Publication No. 1504)*

Elden L. Brigham, Ph. D.
University of Michigan, 1950

Method

A combined interview and questionnaire technique, using a survey schedule composed chiefly of rating-scale items, was employed to follow up 469 graduate and drop-out subjects of a carefully controlled educational and vocational guidance experiment in Flint, Michigan, 1939-43, five years after the class had graduated from high school.

Statement of the problem

The purpose of the follow-up investigation was to determine what differences, if any, were to be found in the educational and vocational adjustment and in the vocational success of the two halves of the same high school class when one half is given only general or incidental guidance and the other half is given a carefully planned and administered program of intensified guidance over a four-year period.

Returns

Responses were obtained from 60 per cent of the original subjects, 145 experimental and 133 control-group members. Responses

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from graduates exceeded those from drop-outs in the proportion of about two and one-half to one.

Summary of findings and conclusions

The evidence varies from reasonably certain to virtually certain that intensive guidance was influential in bringing about the following results: (1) a closer relationship between vocation and measured interests on the part of the experimental men and women, (2) the graduation from high school of a higher percentage of experimental subjects, especially men, (3) fewer changes in curriculum for the experimental subjects of both sexes during their high school careers, (4) plans to obtain and the actual attainment by experimental women of advanced training at the college or the university level, and (5) the attainment by both the experimental men and women of higher average occupational levels.

On the other hand, the control men obtained significantly higher average school marks and received assignments in military service at higher levels.

Otherwise, the obtained differences are quite consistently in favor of the experimental groups. Many of the differences are of a magnitude approaching the criterion of statistical significance at the 5 per cent level of confidence. Nevertheless, it must be concluded that the case for the relative effectiveness of intensive over incidental guidance is not proved.

THE STATE AND NONPUBLIC SCHOOLS

(Publication No. 1528)*

Elizabeth Brennock Carey, Ph. D.
New York University, 1949

The Problem

This investigation studies the relationship of New York State to its private and religious schools at the elementary and secondary level. Past and present trends from 1777 to 1948 have been analyzed and recommendations have been based on an evaluation of these trends and accepted principles of state school administration. New York State was chosen since it may be considered a representative sample of a larger universe, the United States. One fifth of the children attend these schools. Recent developments in various states and on the national level have focused attention on the problem.

* Microfilm copy of complete manuscript of 336 pages, \$4.20.
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Method

Original sources were investigated, data were obtained from the State Education Department, authoritative treatments of state school administration were analyzed and a documentary survey of research was made. Confirmation was obtained from the Legal Division of the Department for all legal data.

Findings

The Constitution forbids the use of public monies in aid of denominational schools except for examination, inspection and transportation of children. The Education Law provides for incorporation, the powers of the Regents and Commissioner, mandated instruction and compulsory attendance.

The historical background indicates education under the joint auspices of church and state until the middle of the eighteenth century. The use of public funds for denominational schools was discontinued shortly after. Education was not mentioned in the first constitution and the state's system grew through legislative development. Throughout its history the state has recognized the right of private and religious schools to exist and the responsibility of the state for their regulation. No situation has been more fluid in our history than the relation of church and state in regard to education. Currently opinion is divided in the country on questions of school and state but the principle of secularization is accepted by the majority of the people in every state. There is a cooperative approach between other state departments and with the local fire and health agencies in discharging responsibilities.

One fifth of the children of compulsory school age attend the nonpublic school. The application of principles of state school administration shows endorsement for the state's policies. An appraisal indicates strengths as (1) recognition of nonpublic schools (2) right of choice of school by parents (3) attendance meets the provisions of compulsory attendance (4) prohibition of public funds for denominational schools (5) application of mandated instruction and educational requirements (6) guarantee of certain services to all children by the state.

A weakness in the laws seems to be that elementary schools do not have access to the kind of educational approval granted secondary schools. It appears there would be gains for both the non-public schools and education in the state if general procedures to be applied equally to all schools governed by the Compulsory Education statute were established. The state does not seem to exceed its authority as mandated by the Constitution, the Education Law, and its rules and regulations.

Conclusions

In general the constitutional, legal and juridical grounds on

which the state's relationship is based are sound and are endorsed by leaders in state school administration. Recommendations for changes include (1) action by the Regents Commissioner and Cabinet (2) admission of elementary schools to the University (3) accreditation of nonpublic schools (4) extension of supervisory control through compulsory attendance regulations (5) Regents committee, Advisory Council and general conference on problems of nonpublic education.

**A PROPOSED PROGRAM FOR THE DEVELOPMENT
OF EDUCATIONAL LEADERSHIP IN THE PUBLIC
SECONDARY SCHOOLS OF HAWAII**

(Publication No. 1486)*

Cecil K. Dotts, Ed.D.
New York University, 1949

The purpose in this investigation is to analyze and describe the need, and to propose a program, for the development of educational leadership in the public secondary schools of Hawaii. The emphasis is on those functions for which the Director of Secondary Education in the Department of Public Instruction in Hawaii is responsible, especially curriculum development and the improvement of instruction.

Education related to the needs and capacities of pupils has been encouraged for years in Hawaii. A program for the development of educational leadership is needed to assure the continued improvement of education.

Criteria of educational leadership were established through a consideration of data from (a) a study of relevant literature; (b) visits to schools and school systems; and (c) ratings of forty-seven items by a jury of fifteen educators.

The needs of the public secondary schools of Hawaii were analyzed, using the criteria as the basic reference.

Fourteen schools and school systems were selected as those having significant practices in the development of educational leadership. The criteria were a guide in the consideration of these practices, and the practices provided data for modification of the criteria.

Educational leadership is that process through which school and community personnel use their abilities and energies for the improvement of the education of people of all ages. Democratic

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leadership requires opportunity for cooperative undertakings in which people share in planning, executing and evaluating. An instance of democratic educational leadership is an instance of the contribution of an idea or act which is accepted by the group as advancing purposes of the group.

The criteria of educational leadership are stated as assumptions, skills needed, and desired outcomes. Significant assumptions in the criteria are: Respect for the dignity and worth of the individual is recognized as basic to the whole concept of democracy; a clear idea of a goal and of the nature of the problem is necessary in problem solving; the educational program should be based on the personal and social purposes of pupils.

Significant skills needed for democratic educational leadership are the ability to join with others in contributing toward friendly, confidence-inspiring relations among people; the ability to join with others in continuous evaluation of practices and in using the results of evaluation in further planning.

A desired outcome of educational leadership considered significant is: Increasing power of pupils, teachers (and others) to adjust, to solve problems, to express themselves, to maintain poise, to grow in social attitudes and to mature in behavior.

The needs of Hawaii in the development of educational leadership are essentially those which relate to the criteria established in this study. Significant needs are: Providing people with increased opportunity and encouragement to study together the political, social and moral questions that are common to all; increasing participation of people in policy forming.

The function of teachers, administrators and other personnel of the public secondary schools of Hawaii, as recommended in this investigation, is to encourage participation of pupils, and of themselves, in experiences which will contribute to the development of certain attitudes. These attitudes include sensitivity to the necessity of: (a) an environment that will encourage improvement of the total community and the school; (b) a definition of pupils' personal and social needs; (c) encouraging experimentation and the development of creativity; (d) providing conditions that will give opportunities for cooperative planning, executing and evaluating.

The proposed program for the development of educational leadership in the public secondary schools of Hawaii is a program through which people can have experiences in developing the recommended attitudes. The details of such a program evolve as people plan and work cooperatively.

AN EVALUATION OF THE CHANGES IN CERTAIN SOCIAL
BELIEFS, SOCIAL VALUES, AND THINKING SKILLS
EFFECTED IN COLLEGE STUDENTS BY A SOCIAL
STUDIES COURSE BASED ON THE PROBLEMS-APPROACH
METHOD OF TEACHING

(Publication No. 1529)*

George Leonard Fersh, Ph. D.
New York University, 1949

The study originated from the need of the Social Studies Department of the New York University School of Education for a scientific evaluation of the degree to which a newly-developed introductory course in social studies for college freshmen based on the problems-approach method of teaching was succeeding in achieving the departmental objectives. To provide the course evaluation desired by this department was considered of importance because insufficient evidence existed generally concerning the effectiveness of the problems-approach as a method for the teaching of social studies, and because the evaluation would be in terms of departmental objectives that were concerned with patterns of mental behavior rather than the conventional objectives of content mastery.

The basic data for the study were obtained by the administration of tests designed to measure social beliefs, social values, and the ability to interpret data to those participating in the research. The tests used were those that had been formulated and validated for those purposes by the Evaluation Staff of the Progressive Education Association as part of that organization's Eight-Year Study.

To achieve the major objective of the study, that of evaluating the changes effected in certain social beliefs, social values, and thinking skills of the four groups of students enrolled in the problems-approach course (total 92 students), the above-mentioned tests were administered at the beginning and end of the school year. By applying the t test method¹ to the results and establishing the .05 level as the minimum for considering changes as being statistically significant, it was found that in the realm of social beliefs and social values the changes of the students toward both increased liberalism and increased consistency were significant, but that the

* Microfilm copy of complete manuscript of 184 pages, \$2.30.
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1. E. F. Lindquist, Statistical Analysis in Educational Research,
pp. 56-59.

changes in the expression of certainty toward beliefs and values were not significant.

By utilizing the same technique and standards in evaluating the scores of the students in the ability to interpret data, it was found that the changes effected for both accuracy and speed were highly significant.

On the basis of the degree and kinds of changes effected in the students enrolled in the problems-approach course and in consideration of the departmental objectives, it was concluded by the investigator that the results were both favorable and significant for this phase of the study.

In the planning of the study, it was felt that the results could be viewed with better perspective if it were possible to evaluate not only the changes effected in students under the problems-approach method but also to compare the changes effected in students of such a course with the changes effected in comparable students enrolled in a social studies course embracing virtually the same content but taught by a conventional method. To accomplish that objective, a pairing of experimental and control groups was completed in such a manner that it could be assumed for the purposes of the study that the only variable factor was the teaching method.

The conclusions reached for this phase of the study were that the differences in changes in social beliefs and the interpretation of data skill between the two groups were statistically insignificant, but that the more consistent improvements by the problems-approach group in the interpretation of data skill reflected a tendency toward more effectiveness for that method on that teaching objective.

Other data were also collected and evaluated concerning the relationship between the social beliefs of students and

1. other mental behavior patterns;
2. their backgrounds;
3. their instructors' social beliefs.

The study also includes evaluations of the course by the students and instructors and recommendations by the investigator.

THE URBANIZATION OF CONTEMPORARY SOCIETY

(Publication No. 1489)*

Urbane O. Hennen, Ed.D.
New York University, 1949

The resource unit presented in this document — "The Urbanization of Contemporary Society" — has been planned primarily for use

* Microfilm copy of complete manuscript of 227 pages, \$2.84.
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in a social studies course at the undergraduate college level in the School of Education at New York University. This course (Social Studies 013.1,2,3,4) is a basic course in the social studies, organized around "significant contemporary problems, with major emphasis being given to problem solving, and the development of skills in study, thinking, and expression." With the scope of the course defined in terms of "persistent problems in living," it was felt by the Social Studies Department that problems of urban living should be included.

The purpose of the resource unit, as presented, is to provide instructors who will teach the unit with a systematic and comprehensive survey, analyses, and organization of possible problems, issues, student activities, bibliography, teaching aids, and evaluation techniques.

The specific objectives suggested are intended to contribute to the purposes of the course as stated by the Social Studies Department. To be functional in application, the statement of purposes was broken down into specifics of behavior, emphasizing understandings and skills of critical thinking needed in reaching intelligent positions regarding problems of urban living.

An analysis of the major forces, trends, and problems associated with urbanization is presented in an overview of the problem area. This analysis is suggested as one way of viewing the scope of the problem with its ramifications, including various points of view regarding problems of the city. Phenomenal growth of great cities and the increasing urbanization of contemporary society are among the most significant developments of our times. The fact that urbanization has developed not only with breathtaking speed but also at an uneven pace, with material progress going far ahead of man's ability to make satisfactory social adjustments to the change, emphasizes the need for developing the ability to solve social problems. It is these social problems which are of real or potential personal concern to students that furnish the basis for developing learning experiences in problem solving.

Resources for student experiences suggested to provide a wide variety of possibilities for achieving the objectives of the unit are grouped under three main headings: Initiatory activities, developmental or research activities, and culminating activities. A comprehensive list of available materials and teaching aids, including books, pamphlets, periodicals, visual aids, and community resources, has been selected on the basis of the pertinence of these materials in contributing to the purposes of the unit.

Evaluation is thought of as a continuous cooperative process by which students and teacher clarify goals and determine progress toward the goals for which they are working. The suggested resources for evaluation are intended as examples of ways for appraising such behaviors as social sensitivity; the

ability to interpret data; to analyze arguments critically; and to use skills in selecting, appraising, and organizing information.

The unit emphasizes the point of view that all resources suggested are valuable only as they are helpful to instructors in pre-planning learning experiences with students. Each instructor must select from the wide range of suggestions those which meet the needs of his particular students. The resource unit itself may, therefore, be evaluated only as it succeeds or fails to contribute to the purposes of the course, thereby establishing the basis for its revision and continual development.

A CRITICAL STUDY OF CERTAIN CRITERIA FOR SELECTING CURRICULUM CONTENT

(Publication No. 1549)*

Vynce Albert Hines, Ed. D.
University of Illinois, 1949

The purpose of the study was to identify, describe, analyze, and evaluate a number of different principles for selecting curriculum content. Fifteen different approaches to the selection of content were examined for the purpose of identifying principles of selection. Approaches examined included child-experience, developmental-tasks, creative-values, social-values, adult-needs, activity-analysis, educational-shortages, objectives, scientific, frontier-thinkers, socio-economic, social-statistics, universal-institutions, socio-historical, and great-books. Six principles for selecting content were identified: Interest to the learner; utility; contribution to social reconstruction; intellectual discipline; survival value; and significance to an organized field of knowledge. The six principles were then described in some detail as they have been developed, interpreted, and used.

Four criteria were outlined by which the principles could be evaluated: (1) Is the use of the principle relevant to the satisfaction of human needs within the framework of the democratic value system? (2) Is the use of the principle relevant to a planned resolution of the crisis of our times within the democratic frame of reference? (3) Is the principle based upon accurate facts and sound reasoning? (4) Will the principle work to select content?

The principles were then analyzed and evaluated by the four criteria. The analysis consisted of placing the principles in a

* Microfilm copy of complete manuscript of 296 pages, \$3.70.
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broader context of educational and social theory than had been done before in the study with particular emphasis upon the educational purposes embodied in the theory. The supporting assumptions, generalizations, and arguments were explored and an attempt was made to trace the reasoning by which the principles were established.

The study indicated that no one principle of selection was adequate to determine the content of the curriculum for the schools of a democracy. The most important principle, according to the criteria used, was that of contribution to social reconstruction. This was grounded in a belief that cultures and cultural institutions exist to provide for the practical and psychological needs of their members, and that almost all of these needs are either social in origin or are socially modified. It is doubtful if these needs can be satisfied in a culture which continually frustrates them regardless of how much attention may be given to the individual. Hence education in a democracy can best discharge its responsibility to the individual and to society as it contributes to restructuring the institutions of the culture. The second choice for a principle of selection was the principle of interest. Use of the principle of reconstruction gives focus and direction to the curriculum. Use of the principle of interest involves psychological factors without which genuine learning is difficult. This combination of principles could provide for the fullest development of the child within a cultural milieu where he would have an opportunity to realize his potentialities.

Such a combination would not completely ignore other principles of selection or the educational aims identified with them. It would provide for the transmission of the cultural heritage, particularly those parts which are most relevant to the present and to the future. It might also meet the goal of social efficiency associated with the principle of utility. The pupil would be experiencing a curriculum which would be immediately useful to him and at the same time he would be developing into the kind of person who could live and function effectively in a culture over which he and others had more and more effective control.

A STUDY OF HIDDEN TUITION COSTS IN SELECTED ILLINOIS HIGH SCHOOLS

(Publication No. 1550)*

Martin Curtis Howd, Ph. D.
University of Illinois, 1949

Research studies indicate that the public high schools are not cost-free institutions and that the expenditures associated with attendance in them are important factors in determining whether a child will attend and continue in the school to graduation.

If these conditions are to be changed each school must take the necessary action for the reason that each school system has jurisdiction within limits in establishing the policies affecting those things for which pupils are required to expend money. Therefore, it would appear highly desirable for those in charge of the high schools to be made aware of the kinds of things for which pupils are assessed money and the amounts expended for them, and, secondly, to have available to them a device or technique by which they could discover the facts concerning their own local expenditures.

The present study was designed to do these two things for Illinois high schools by:

1. Discovering the character and magnitude of whatever expenditures the high schools selected for this study may be imposing upon their pupils. (The costs of food, shelter, ordinary clothing and transportation were excluded.)
2. Designing and demonstrating the use of instruments and procedures suitable for self-surveys of this type by interested school faculties.

In this study the expenditures that high schools imposed upon their students were called "hidden tuition costs." These costs included the sums of money that pupils attending public high schools were variously required to pay for: (a) materials used in the classroom, (b) dues, fees, and equipment required for participating in extracurricular activities, (c) attendance at school sponsored functions, (d) various general expenses, other than food, shelter, ordinary clothing and transportation, which were directly related to being a member of the high school.

* Microfilm copy of complete manuscript of 249 pages, \$3.11.
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Three inventories were prepared for securing the per-pupil expenditures made in connection with: (a) the courses or subjects that the schools offered, (b) participation in extracurricular activities, (c) general participation in school functions such as athletic contests, graduations, and the like. The data secured by these inventories were furnished by the principals and the teachers of each of the respective schools. In each case those reporting were requested to submit all of the charges which the school either required or sanctioned. These inventories were submitted to 79 schools which had previously indicated a desire to participate in this study.

From the expenditures submitted by the various schools it was found that:

1. There was no school free of cost to the pupils.
2. There was no established pattern of costs.
3. Many of the schools which supplied textbooks free provided courses which were free.
4. The highest per-pupil expenditures were found in those situations in which students purchased their own textbooks.
5. Expenditures associated with participation in the various extracurricular activities varied principally with the practice followed in making available equipment, parties and trips with the smaller costs being in those schools which provided the greater proportion of these items.
6. Schools which provided pupils with a student activity book for admission to contest, performances, parties, dances, and for securing copies of the school publications were able to provide those at less cost than in schools in which students purchased single admissions or single issues of a publication.

A SYLLABUS FOR STUDENT-TEACHING IN ART

(Publication No. 1531)*

Elizabeth Adams Hurwitz, Ed. D.
New York University, 1949

Art education now seeks crystallization of its most significant contribution to education, the creative approach to instruction. Art was a "cultural" supplement to formal education in the early nineteenth century; it was favored as formal discipline and as preparation for industry in the 1880's; as the "handmaiden" of other school

* Microfilm copy of complete manuscript of 330 pages, \$4.13.
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subjects in the correlated curriculum, art assumed more general significance. It has emerged in the child-centered curriculum as a potent factor in developing individuality and social functionalism as goals of education.

The preparation of teachers of art needs re-evaluation with the new responsibilities of art education. In student-teaching, uncoordination has been evident in applying educational philosophy to actual art activities. Art teachers pursue the new, still shackled by the older concepts, for want of conclusive experimentation and for want of organization in their experiences as student-teachers.

A preliminary survey of practices in art teaching solicited opinions from art teacher members of the Eastern Arts Association, as to (a) teaching techniques they find useful, (b) adequacy of their preparation for professional needs, (c) experiences they recommend for student-teachers. The responses revealed a definite trend toward social needs as a basis for art activities. An emphasis on technical proficiency rather than on art as a means of social communication is felt as an inadequacy in art teacher preparation.

Supervisors of art student-teaching in the area covered by membership in the Eastern Arts Association were requested to respond, using the same check list, and to supply statements about supervisory practices. The replies emphasized the lack of coordination between art teacher education institutions, and indecision as to aims, objectives and methods of supervision.

A syllabus for art student-teaching has been designed as a guide to desirable activities for prospective teachers of art and to methods of supervision. Aims have been formulated consistent with movements in education in general, with trends in teacher education and with the new emphasis within art education. Paramount among these are

1. (in general education) Self-realization of American democracy as a goal of American education.

2. (in teacher education) The recognition of the teacher as a self-directing and creative person.

3. (in art education) An emphasis on experimenting with and crystallizing creative modes of instruction.

Specific objectives related to (a) how to select activities and subjects in art, (b) how to direct and develop techniques in art expression, (c) how to analyze the needs of pupils and (d) how to organize an art program, are developed in relation to the aims above.

Observation and informal contacts with children occur in each year of art teacher preparation. Broader opportunities for observation, participation and initiatory experiences provide an induction to student-teaching in the fourth year. Complete control of art activities in a planned art program for a laboratory or cooperating public school culminates in the baccalaureate degree in art education.

A fifth year of responsible teaching with remuneration, supervised cooperatively by the art teacher education institution and the schools which employ beginning teachers of art leads to full certification to teach art in the public schools.

A scale for evaluating art student-teaching, devised and used by the designer of the syllabus over a period of nine years, is presented. It is recommended as a self-evaluative device, as a diagnostic means, as a record of progress and as evidence of competence, in conjunction with other information, for guidance and eventual placement of the student in an art teaching position.

FLINT'S FISCAL CAPACITY TO SUPPORT SECONDARY AND ADVANCED EDUCATION

(Publication No. 1517)*

Franklin K. Killian, Ed.D.
University of Michigan, 1950

This is a study of a community's ability to support secondary and advanced education. The problem was considered in two phases: (1) the financial development of a complete program of secondary education, and (2) the financial development of a four-year liberal arts college with considerations for advanced professional training. The needs of Flint were studied in relation to these two phases of the problem, and recommendations made in terms of the financial ability of the community to support these programs. The potential enrollments and curricular analyses on which the estimates were based were prepared in an earlier study.

The techniques used in this study were essentially those required in a survey of current conditions and limited to the collection, description, organization, integration and evaluation of data. The chronological period of time from which the data were selected was largely the present decade. Not only was Flint studied but reference was also made to the current literature, research reports, and to state and national surveys which could contribute to the solution of the problem. Only simple arithmetical procedures were used in handling the data.

Analysis of the data lead to the following conclusions concerning Flint's fiscal capacity to support secondary and advanced education.

1. General expansion of educational facilities in upper secondary

* Microfilm copy of complete manuscript of 199 pages, \$2.49.
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and advanced education will require increased appropriations from three levels of government — local, state, and Federal.

2. The consensus of opinion indicates that local agencies are not able to initiate or to support such programs alone.

3. Flint should not attempt to establish a four-year college program. The costs are too great for the small number of students served. Flint has too many obligations for the revitalizing of the whole school program and for modernizing public service agencies for the city government. Moreover there is danger that once established a four-year college may grow into graduate study requiring undue sacrifice in the local community.

4. Flint should concentrate on a complete program of secondary education (community college program) and integrate this program into the present elementary and secondary schools.

5. A number of scholarships and fellowships should be established to care for the academically and professionally minded youth who do not have sufficient resources to attend senior college or the university.

6. Flint is financially able to provide one of the finest elementary and secondary school programs in the United States and to adapt the program to the needs of its diverse population.

THE EFFECTIVENESS OF SCOUTING IN CITY AREAS OF HIGH DELINQUENCY

(Publication No. 1492)*

Leroy L. Kohler, Ph.D.
New York University, 1949

The problem which is considered in this study is an analysis of the extent to which Scouting can be used in occupying the leisure time of boys in deteriorated, urban delinquency areas.

Scouting has been criticized because so few Scout Troops are located in densely populated, low income neighborhoods. These areas frequently have the highest rates of juvenile delinquency and often lack facilities for constructive recreation.

Prior to 1940, such criticism was well-founded because Scouting had been predominantly a program entered into chiefly by boys from homes in middle or higher income brackets.

By 1935, however, there were Scout Troops for deaf, blind, crippled, feeble-minded and institutionalized boys as well as 296

* Microfilm copy of complete manuscript of 302 pages, \$3.78.
Enlargements 6" x 8", 10¢ per page. Library of Congress
Card Number Mic A 50-11.

troops for boys in delinquency areas, of which one-half were police sponsored. Since 1937, the Buffalo Boy Scout Council has been experimenting with Scouting in its underprivileged neighborhoods. The success of such efforts in Buffalo as well as in Cleveland, Chicago, Kansas City and St. Joseph, Missouri, paved the way for the use of funds made available in 1940 through the kindness of Irving Berlin to develop such work in other cities.

At the outbreak of World War II, approximately 4,000 boys from delinquency areas were among the nearly 1,000,000 boys enrolled in Scouting. This may seem insignificant statistically yet it denoted definite progress after only one year of deliberate organizational effort under the Berlin Fund. Two years later, Scouting had been instituted in twenty-five "less chance" areas throughout the country enrolling nearly 10,000 boys in 437 troops.

Scouting was, nevertheless, difficult to organize in delinquency areas. The present study indicates many of the difficulties involved in organizing and developing Scouting in these neighborhoods.

The method of approach used in organizing Scouting in delinquency areas has varied in each council although the fundamental principles of the Scout approach to delinquency prevention have been maintained.

In this study an intensive analysis is made of Scouting in specific delinquency areas of Buffalo, Chicago and Peoria, Illinois. In all three cities, despite considerable variation, Scouting was established successfully. In practically every instance, the figures employed in the study are from official court or agency records. Scouting's effectiveness was judged as objectively as possible in each case in terms of fifteen criteria. These criteria are such as can be used elsewhere in similar studies of Scouting. Statistical findings have been clarified and substantiated throughout the dissertation by the use of numerous tables, maps and case histories wherever possible.

The conclusions have been substantiated by correspondence with Scout Executives in delinquency areas throughout the country. It has been found in all cases that Scouting, properly introduced into these deteriorated areas, is not unwelcome and may well become a constructive influence in such neighborhoods.

Scouting, however, cannot interest every boy of Scout age. It, alone, is not a preventive of juvenile delinquency. In addition, it is not a reform program and its objective is not primarily that of delinquency prevention. Nevertheless, the records indicate that boys in delinquency areas enroll in Scouting as frequently as boys elsewhere, remain as long and seem to benefit as much, if not more so, from such experience.

The National Headquarters of the Boy Scouts of America claims that three of four boys questioned want to be Scouts. If this

is so, the findings of this study would seem to indicate that Scouting, in cooperation with other recreational agencies, should develop its program in underprivileged neighborhoods, even more widely than to date. This would seem to be necessary if Scouting is to have any measurable effect upon delinquency.

NATIONAL SCHOOL BROADCASTS OF THE CANADIAN BROADCASTING CORPORATION

(Publication No. 1568)*

Walter Kingson Krulevitch, Ed.D.
New York University, 1949

This study presents an account of the history and development of the national school broadcasts of the Canadian Broadcasting Corporation, the only school broadcasting service available on a nationwide basis in this hemisphere. Comments on script writing and production, utilization suggestions, and introductions by the investigator to typical program types presented on the national school broadcasts, give the thesis the character of an introduction to school broadcasting of value to teachers, administrators, program directors, and broadcasters in this country.

The Canadian Broadcasting Corporation endeavors, through its programs, to help create a national unity in Canada, a country of vast distances and with a small, widely-scattered population of differing historical, religious, and cultural traditions. The CBC national school broadcasts contribute to this aim. Their central objective is to strengthen national consciousness among boys and girls by making them better acquainted with the lives and problems of their fellow Canadians throughout the Dominion and with the achievements of Canadian democracy. Programs designed to achieve this end are divided into five categories: Stories of Achievement, Places in Canada, Canadian Resources, Stories of Democracy, and Canadian Culture.

These broadcasts usually take the form of twenty minute dramatizations, and are preceded by "What's in the News," a ten minute news review and feature story on the most significant news event of the week. In the past six years, 287 programs in 31 series have been presented on the national school broadcasts. These are carried over a network of 48 stations every Friday, at different times in each province to adapt to time differences in the five zones of the Dominion.

* Microfilm copy of complete manuscript of 366 pages, \$4.58.
Enlargements 6" x 8", 10¢ per page. Library of Congress
Card Number Mic A 50-12.

The National Advisory Council serves as the controlling body for the national school broadcasts. Composed of representatives of the provincial departments of education and other nation-wide educational organizations, the Council meets each March to approve the schedule of broadcasts for the forthcoming year.

Begun in 1942 as a cooperative effort of the provinces and the CBC, since 1943 the national school broadcasts have been prepared by the School Broadcast Department of the CBC and are available to practically all schools in Canada. The provincial departments of education originate their individual schools of the air in cooperation with the CBC to supplement the national programs. At the present time about 20 per cent of the schools in Canada make use of radio for classroom listening.

To aid in the utilization of the national school broadcasts, the Department annually issues a 48-page teachers' manual, Young Canada Listens, listing all programs and providing a synopsis of each. However, since education is a function of the provinces, the provincial departments of education object to any attempts by the CBC to supply detailed utilization suggestions for the programs. As a result, insufficient material is included in the manual for best utilization of the programs. Nor has a thorough-going plan for evaluating the national school broadcasts been put into effect.

The strength of the national school programs lies in the fact that they are planned by broadcasters in cooperation with educators of the Advisory Council, and are prepared with the advice of educational consultants. Further, all programs are written by professional script writers on assignment, and are produced by a professional producer who specializes in school broadcast production.

Counting staff, talent, publications, and wire line costs, the overall expense entailed in presenting the national school broadcasts is estimated to be \$100,000.

PREDICTING COLLEGIATE SURVIVAL FROM PRE-ADMISSION DATA

(Publication No. 1532)*

Gordon Lundy Macdonald, Ph. D.
New York University, 1949

The Problem

General Statement

The purpose of the study was to determine if an evaluation of certain data available at college entrance may not provide a means of predicting which students can be expected to remain more than one year.

Sub-Problems

In addition, certain incidental investigations were conducted relative to scholastic achievement of veterans and non-veterans, and graduates of the different high schools; opinions of former students relative to their reasons for leaving; and a correlation study of a substitute criterion (Point-Hour Ratio).

Definition

The criterion for persistence was the remaining in school more than one calendar year.

Significance of the Problem

The nature of the student population at the University of Toledo indicated a need for additional information relative to its background and its potential persistence and scholastic achievement.

Procedure

Data Compilation

The data collected from the University records included information about 1,322 individuals regarding: sex, veteran status, age,

* Microfilm copy of complete manuscript of 177 pages, \$2.21.
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Card Number Mic A 50-13.

high school from which graduated, college of original matriculation, high school cumulative average, scores on the Ohio State Psychological Examination, the Nelson-Denny Reading Test, the adjustment scales of the Bell Adjustment Inventory, and the cumulative college grades for the first year.

Statistical Treatment

The data were assembled in contingency tables constructed for each of the above factors; in which the rows of the tables are defined by the categories of the factor and the columns denote the category of the status of the students.

The percentage of the total remaining in college was computed for each of the factor categories. These percentages were interpreted as the probability of remaining in college more than one year. The percentages were then transmuted into a scale value and considered as a score which was used in the computation of the product-moment coefficient of correlation between the factors, and also between the factors and the criterion, as well as the substitute criterion. The criterion was treated as a dichotomous variable while the substitute criterion was treated as a continuous variable.

Results

Intercorrelations

The highest intercorrelations between the factors were found between the part scores and the total of the Nelson-Denny Reading Test, between these scores and scores on the O.S.P.E., between cumulative high school grades and college of original matriculation, as well as between sex and veteran status. The four adjustment scales of the Bell Adjustment Inventory had practically zero coefficients for all intercorrelations as well as coefficients of the same value for the correlations with the criterion and substitute criterion.

Criterion Coefficients

The coefficients for eight of the criterion correlations were low but reliable. The cumulative high-school grades - criterion correlation of .231 was raised to .331 by computing a multiple R from five of the variables. The standard error of estimate was 1.646 with a reduction of errors in prediction of 5.7 per cent.

Substitute Criterion Coefficients

The substitute criterion correlations were much higher than the criterion correlations. These were in general agreement with

those of other investigators who have made similar studies. The cumulative high-school grades yielded an R of .509 and the multiple coefficient raised it to .601. The standard error of estimate was 1.393 with a reduction in errors of prediction of 20.2 per cent.

Incidental Investigations

There was no difference in scholastic achievement of veterans and non-veterans, but there was a significant difference between the graduates of two high schools when compared with graduates of other high schools as determined by the critical ratio technique. Most of the females withdrew to get married, and most of the males withdrew because of scholastic difficulties according to questionnaire replies of a limited group.

Conclusions

While the study showed prediction of persistence was possible, the same factors predict scholastic success much more efficiently. It may also be concluded that persistence and scholastic success are not synonymous at the University of Toledo.

Recommendations

This study should be continued over the four year period. The Bell Adjustment Inventory and the Nelson-Denny Reading Test should be eliminated because they were not found to be serving any useful purpose. A further study should be made to determine what other factors may profitably be used to determine collegiate persistence.

THE DEVELOPMENT OF RELIGIOUS QUALITY IN EXPERIENCE

(Publication No. 1493)*

Ward Ellis Madden, Ed.D.
New York University, 1949

This inquiry undertook to discover and develop the implications of John Dewey's theory of experience for a theory of the religious quality in experience, and to propose the principles of an educational program whereby religious quality can develop in the experience of children.

* Microfilm copy of complete manuscript of 282 pages, \$3.53.
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To this end Dewey's major works were consulted and the basic features of his theory of experience identified. Next the phenomenology of religion was investigated, as reported by scholars in the fields of sociology and psychology of religion and cultural anthropology. An interpretation of the social, psychological and religious meaning and significance of such phenomena as worship, cult behavior, myth, mystical experience, ritual, religious organization and religio-social behavior was made in the light of Dewey's general theory of experience.

From this it appeared that there is religious quality in behavior when individuals participate freely with others and with nature in creative social relations which transform for the better both the community and the individual selves involved.

In such relationships certain moods generate which seem to be generic traits of religious experience. Four of these were identified and described in detail.

The valuational mood is the emergence from the creative social act of idea values of existence to which the participants dedicate the conduct of their lives. Through the experimental trying out of values in the conduct of life, values are simultaneously integrated and differentiated. The integration of value produces an evolving structure of ideal value which becomes an object of religious devotion. The ultimate object of devotion, however, is not any existing finite value-structure, but the infinite source of value — the creative social act.

The community mood is the emergence from the social act of a spirit in which the participants become united as brothers and in which their selves are purified and transformed. The social act indefinitely expands both community and selfhood, so that the infinite expansion of community and self, rather than any given finite community or ego, becomes a religious ideal. Again the social act, as the ultimate source of both community and selfhood, is the final object of devotion.

The executive mood is the full mobilization of resources and energies in order to execute the axiological commitments to which conduct is dedicated.

The esthetic mood consists of involvement in the drama of conflicting forces, ending in fulfilling consummation when ideal values are realized.

In the light of the foregoing conclusions the following principles of education were proposed:

First, the creative social act should be the characteristic feature of the school curriculum. It should be the basis of every school activity to which it is applicable and should characterize the relations of pupils to one another, of pupils to teachers, of teachers to administrators, and of school to community.

Second, through participation in the social act children experience, test, integrate and differentiate values, so that there develops a growing structure of ideal value to which they dedicate their lives.

Third, children develop an expanding sense of community and selfhood through participation in the social act.

Fourth, involvement in the social act enables the child to locate properly the ultimate source of value, community and selfhood. His supreme loyalty should be to the social process which creates these.

Fifth, involvement in the struggle between the forces supporting and those opposing the social act leads to esthetic consummations which increase the child's faith in the transformability of existence.

Sixth, the commemoration and celebration of the ideal values revealed through the social act mobilizes the child's non-rational and rational energies in the pursuit of such values.

THE DEVELOPMENT OF AREA VOCATIONAL SCHOOL PROGRAMS IN NEW YORK STATE

(Publication No. 1533)*

Nelson Jacob Murback, Ed.D.
New York University, 1949

The problem has been to study area schools on the secondary level to determine a pattern for the possible establishment of area vocational schools in New York State.

The problem is important in the sense that area vocational school programs, as an extension of the secondary school curriculum, might aid in implementing the slogan, "equal educational opportunity for all youth."

Area vocational school programs in New York State have, historically, been the fruits of individual projects on the local level, financed, in part, locally and through state and federal aid. However, traditionally, they have been, in the main, post high school programs, without benefit of leadership from Albany.

Although planning and financing are basic problems in setting up area vocational school programs, the legal structure for them exists.

The securing of data has been a matter of the study of all existing written material plus the gathering of more by personal visitation, correspondence, library research and firsthand experience.

* Microfilm copy of complete manuscript of 325 pages, \$4.06.
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More specifically, the facilities and libraries of the Research Division and the Bureau of Technical and Industrial Education of the New York State Education Department, were used.

Results have been based on information concerning existing area vocational schools; information concerning the need for area vocational schools and suggested plans for the establishment of area vocational schools.

Need for area vocational school programs has been established on the basis of evidence indicating unequal educational opportunity throughout New York State based on: (1) sparsity of school population centering on small schools throughout New York State, (2) limited curriculums due to the smallness of existing schools in the state, (3) drop-outs due to lack of interest in school offerings, (4) academic bias in minds of many educators, (5) lack of money to provide a broad program of education.

Weaknesses of the current means of establishing area vocational school programs lie in the fact that total responsibility for establishing these programs is placed on the local administrative unit. The locality, in turn, does not meet the problem because it lacks either, (1) the ability, largely financial, or (2) the disposition to do so.

Uniformity in establishing area vocational schools can be achieved only by state-determined and established vocational school program areas, varying in size and boundaries, according to local educational needs.

The precedent for a state plan for area vocational schools can be found in the "Master Plan for School District Reorganization New York State." A similar "master plan" for area vocational school programs should be adopted which would consider such factors as: Individual area needs, wealth available for tax purposes, transportation, social and economic status of the individual area, school building facilities and problems peculiar to the individual area.

The plan should be administered by the State Education Department and leadership should be forthcoming from the same source.

AN EVALUATION OF THE PUBLIC SCHOOL PROGRAM IN ROANOKE RAPIDS, NORTH CAROLINA

(Publication No. 1534)*

Isaac Epps Ready, Ed. D.
New York University, 1949

The Problem

This study is an evaluation study of the public school program in Roanoke Rapids, North Carolina. It was conducted for the purpose of discovering the effectiveness of the school program in meeting children's and community needs and for the purpose of stimulating improvement.

The Method

Self-evaluation was the method chosen for this study. No outside "expert" was brought in to assist. The findings and recommendations are the results of the cooperative investigations and thinking of the local faculty, students and parents.

Procedure

Volunteer participation by teachers, students and parents was secured. A faculty Steering Committee assisted the investigator in planning the investigations to be made. The following steps were taken.

1. The investigator examined statements by authorities and developed a general outline of children's needs and the areas of community life that should be investigated.
2. Parents, teachers and students filled out check-lists and participated in group discussions in which children's needs and areas of community need in Roanoke Rapids, North Carolina, were identified.
3. In the light of the needs identified, the educational objectives of the local school system were examined and, through group faculty discussion, revised and approved by the entire faculty group.
4. A careful survey of the present local public school program was made.
5. Teachers, parents, students, School Board members and other adults in the community all participated in evaluating the school's effectiveness in realizing its educational objectives. Parents and teachers made observations of child behavior. Check-lists

* Microfilm copy of complete manuscript of 200 pages, \$2.50.
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showing their observations were filled out by seventy-nine teachers and 1,417 parents. Approximately two hundred and fifty students participated actively in group discussions. All phases of the local public school program were examined carefully and comparisons were made between the provisions made and the provisions authorities state should be made in a good school system.

6. Based on the evaluations and on the improvements suggested by parents, teachers and students, the local faculty and School Board members agreed upon recommendations for improvement.

Outcomes

In appraising the outcomes of the study, the investigator reached the following conclusions:

1. The school's program as a whole is better understood, weaknesses have been identified and definite recommendations for improvement have been made.

2. The method of the study in securing wide participation of students, parents and teachers in making the investigations and recommendations has made all of these groups more willing to cooperate in making the suggested improvements.

3. In directing attention to children's needs, the study has stimulated parents and teachers to learn more about the nature of child growth and development.

4. More emphasis has been given to the school's function of improving the quality of community life.

5. Educational objectives have been stated in terms of children's needs and have been accepted by the faculty as a whole.

6. The study gives promise of being the beginning of a continuous program of evaluation and improvement in the local school system.

Conclusions Concerning the Type of Study Conducted

1. This cooperative self-evaluation study was found to be most valuable in causing teachers to re-think their educational objectives and in stimulating growth in the school and the community.

2. Without "expert" direction, the study was weakest in appraising changes brought about in children's behavior and in scientifically validating the hypothesis on which the school program is based.

3. A study such as the one reported here is valuable as a beginning of a continuous evaluation program to be followed up by concerted attack on special problem areas revealed.

A FOLLOW-UP STUDY OF FORMER GRADUATE
STUDENTS OF THE COLLEGE OF EDUCATION,
UNIVERSITY OF ILLINOIS

(Publication No. 1559)*

Donald Martin Sharpe, Ed.D.
University of Illinois, 1949

The College of Education, University of Illinois, Follow-up Study grew out of the belief that closer relationships between the College and its former graduate students would be beneficial to both the College and the former students. The study had three interrelated purposes: First, to improve the liaison between the College of Education and its graduates; second, to discover what these graduates are doing, what problems they have experienced, and some of the attitudes they hold; third, to learn how these graduates feel about the graduate program of the College of Education and what suggestions they have for its improvement.

A printed fifteen page inquiry form was sent to 2,025 persons who had earned a master's degree, or had earned three or more units beyond the master's degree, between 1939 and 1948. Replies were received from 64.7 per cent of the persons available. Investigation of a random sample of the persons who did not reply failed to reveal any significant differences between those persons who replied and those who did not. Interviews with persons who had replied indicated that they had given frank and thoughtful responses on the inquiry form and that the questionnaire had provided ample opportunities for former graduate students to express their opinions about, and attitudes toward, their training program and their work.

The reactions of former graduate students were obtained with respect to the following:

1. The graduate program: (a) Reasons for selecting the University of Illinois; (b) Manner in which first graduate course was taken; (c) Realism with which the graduate training program anticipated professional needs; (d) Evaluation of the guidance program; (e) Appraisal of non-classroom activities; (f) Stimulation and achievement of various goals; (g) Learning outcomes of the graduate program;

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(h) Evaluation of graduate units in Education; and (i) The status value of the master's degree.

2. The graduate course considered "best" and the graduate course considered "poorest"; (a) Nature of content; (b) Method of instruction; (c) Impression of instructor; (d) Instructor-student relationships; (e) Scholarship of instructor; (f) Instructor's understanding of actual school situations; (g) Planning and organization; (h) Practicability; (i) Evaluative procedures; (j) Extent of preparation; (k) Standards maintained; (l) Background and preparation; (m) Interest in; and (n) Values received.

3. Contacts with the College; (a) Types; (b) Suggestions for improving; (c) Relations with the Committee on Appointments.

4. Opinions on specific issues; (a) Sequences of bachelor's-master's degree; (b) Course requirements in the master's degree program; (c) The extramural program; and (d) The advanced professional degree program.

5. Graduates' work and problems; (a) School duties; (b) Community responsibilities; (c) Major problems; (d) Membership in professional organizations; (e) Positions of leadership; (f) Hobbies maintained; and (g) Magazines read.

The following implications for the College of Education were drawn from the responses of the former graduate students: (1) Build on the strengths of the present graduate program; (2) Facilitate the application of theory; (3) Develop a functional guidance program; (4) Provide closer student-staff relationships; (5) Develop a more integrated program; (6) Carefully examine the implications of the five-year program for teacher training before adopting it; (7) Extend the field services; and (8) Explore educational frontiers, stimulate research, but also develop an outstanding training program.

An exploratory investigation of morale revealed: (1) A positive relationship between morale and both professional training and professional status; (2) NO relationship between morale and the number of years of teaching experience, grades earned in graduate work, or sex; (3) A positive relationship between high morale and favorable ratings given on the questionnaire; and (4) the need for further investigation of the relationship between morale and responses on opinion surveys.

A TECHNIQUE IN APPRAISING THE RECREATIONAL OBJECTIVES OF THE SCHOOL

(Publication No. 1560)*

Don Frederick Thomann, Ed. D.
University of Illinois, 1949

The problems created by modern society which young people face upon leaving school, and the role of our schools in preparing youth to meet these problems successfully, define the scope within which the purpose of the study is found. Specifically, the thesis demonstrates a procedure and technique by which the school can readily collect and analyze data on recreation of out-of-school youth, which it can use effectively in evaluation and revision of its own educational program and goals.

The first part of the study is devoted to construction of an inventory which will secure objective data on recreational activities, interests, and desires of out-of-school youth. The responding group, 400 youth who have been out of school from one to five years, is described in terms of selected characteristics which might bear some relationship to its pattern of recreational living. Following this description there is a further analysis of the data in terms of those factors which might influence recreational behaviors and be significant in revealing how successfully the school is achieving its leisure and recreational goals.

The method of analysis which is advocated and demonstrated for readily determining how factors relate to the recreation of out-of-school youth involves use of the chi-square statistic. The respondents are grouped accordingly on the basis of (1) the length of time they have been out of school, (2) the type and extent of their extra-curricular participation in school, and (3) the occupational classification of their fathers. In each of these groupings chi-square is used to determine whether differences in recreational behavior show any relationship to the grouping factor. Related differences can be assumed to have importance for the school in evaluating its educational program and in modifying that program where necessary to successfully achieve the recreational objectives it has established.

Since the thesis proposes a technique in evaluation, it emphasizes that the recreational findings pertain only to the school

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situation which was used to demonstrate the method of collecting and analyzing data for evaluative purposes. The study concludes that the approach it has used is a feasible and rewarding technique in evaluation of the school's educational program, and that investigation of the behavior characteristics of out-of-school youth is a forward step in the appraisal process by which we measure the total outcomes of our educational striving.

A MANUAL FOR CAMP COUNSELORS

(Publication No. 1536)*

Maryhelen Vannier, Ed.D.
New York University, 1949

This study has been divided into two parts. Part I isolated problems existing among counselors and directors in public, private, and organizational camps in the Eastern and Mid-Western sections of the country. These problems were: (1) the controlling influences determining camp leadership, and the duties of counselors under these controls; (2) the qualifications for and means of selecting counselors; (3) the kinds of training received by counselors; and (4) devising standards for the selection, training, and function of counselors. Part II, A Manual for Camp Counselors, contains principles, methods, and materials for solving the problems that were discovered centering around the selection, function, and training of counselors.

Data were received from: (a) 178 directors of public, private, and organizational camps who had employed 4,502 men and women general and specialty counselors; (b) 223 men and women general and specialty counselors in the three types of camps; (c) a jury of seven nationally recognized camp experts; (d) 60 directors of counselor training courses in colleges and universities; and (e) documentary library research. A total of 401 camp directors and counselors from twelve types of camps were studied. Information was gathered from counselors and directors for the study through the means of check-list questionnaires, interviews, and camp visits.

The majority of counselors employed represented the field of health, physical education, and recreation, and were college students. Organizational campers had more opportunity to express their program desires than did private or public campers. The counselor's responsibilities depended largely upon whether he were a general or specialty counselor. Variation in duties of the two types of

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counselors was determined by the philosophy, objectives, and type of camp.

The chief source for obtaining counselors was from colleges and universities. Professional and personal qualities directors most desired in counselors were discovered. Chief weaknesses of counselors found by directors were: the inability to use democratic methods, inspire campers, and contribute to the camp program. Areas in which directors believed counselors needed more training were: methods in democratic leadership, camping as a means of education, child psychology and guidance, camp philosophy, camp-craft, and recreation.

Wide variation existed in the content of counselor training courses conducted by camps, organizations, and colleges. Counselors believed that the most valuable training was the pre-camp training given by directors. The Jury of Educational Experts explored the educational possibilities of camping, and suggested methods through which school camps might be inaugurated. The Jury of Camp Experts devised standards for the selection, function, and training of counselors.

As a result of this study, the author has reached the following conclusions:

1. The gap is great between standards recommended by the juries of educational and camping experts, and those of the American Camping Association, for the selection, function, and training of counselors and actual practices that exist in camps.
2. There is a pressing need for the adoption of the standards developed by the Jury of Camp Experts.
3. Directors are not selecting, training, or utilizing counselors to the fullest extent according to their own needs.
4. The educational possibilities inherent in camping will and can only be fully realized when more carefully selected and better trained leadership is supplied to conduct this informal and unique type of education.

Areas in which counselors must receive more training were developed in Part II. These included: the educational role of camping in America; the selection, function, and training of counselors; helping counselors understand children; the counselor as a leader; the role of the counselor as a group builder; the counselor and the camp program; program materials for counselors; the role of the counselor in promoting healthful and safe camping; and the counselor's responsibility for keeping records and writing reports.

THE ESTABLISHMENT OF A FUNCTIONAL GUIDANCE
PROGRAM IN THE RURAL NEGRO HIGH SCHOOLS
OF EASTERN NORTH CAROLINA

(Publication No. 1498)*

W. H. Watson, Ed.D.
New York University, 1949

The Problem

The problem represented by this research was to develop a functional guidance program for the Negro high schools in certain rural areas of eastern North Carolina. The following sub-problems were considered:

1. To determine the guidance practices being carried out at present, and the extent of their use.
2. To determine the provisions made for guidance by local school authorities, and the State of North Carolina.
3. To discover the difficulties involved in setting up a desirable program.
4. To develop the criteria necessary for a desirable guidance program within the geographical area of the survey.
5. To indicate the initial steps necessary to inaugurate whatever program was proposed.

This study was limited to a survey of ten rural Negro high schools within a fifty-mile radius of the Newbold Training School, Dover, Craven County, North Carolina.

The Findings

Materials listed under this heading included returns from 917 high school pupils and fifty-four teachers of the schools surveyed. The following are the chief findings:

1. No formal guidance programs existed in nine of the ten schools investigated. Principals of these schools claimed no previous experience with, or knowledge of organizing guidance programs.
2. Sixty per cent of the pupils received occupational guidance services from members of their family; further, seventy-four per cent of these pupils sought the advice of members of their family on problems of all kinds.
3. Fathers and mothers of these families, in the great majority of cases, did not complete an elementary education, which fact

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presumably rendered them incapable of offering adequate guidance services to these children.

4. Pupils were interested mainly in preparing for occupations not available to them within the geographical confines of the investigation.

5. Teachers in these schools all had a minimum of four years of college training, yet only one in three had had formal courses in guidance.

6. Coordination and utilization of the available community resources by school agencies was not discernable in sufficient degree to be considered significant.

7. The high mortality rate of the itinerant farm children, the poor physical plants of the schools, the lack of sufficient funds for any normal activity, the scarcity of teachers well trained in guidance practices, and the desire of most rural teachers to change urban situations were among the many difficulties discovered in organizing a program of guidance.

Recommendations

In view of the findings resulting from this study, the recommendations which follow are the principle ones which should enable the rural Negro schools of eastern North Carolina to contribute more effectively to the all-round development of pupils through organized guidance services. It is recommended that:

1. Each school undertake the organization of a guidance program. Suggested preliminary steps include (a) the designation of some person to organize the program, (b) the delegation of details to other interested faculty members, (c) the formulation of policies, (d) the consideration and adoption of a philosophy, and (e) the setting up of objectives to be achieved based upon a present need.

2. This program of guidance emphasizes (a) a study of occupations, (b) the educational phase of guidance, and (c) the social aspects of guidance. Social guidance is a term used to describe any type of guidance that may not be easily designated as vocational or educational guidance.

3. The coordinated services of all community agencies presuming to be interested in the school and its problems be utilized.

4. Each school provide for efficient placement and follow-up services, the extent of which is the problem of individual schools.

5. Each school establish and maintain continuous research services.

6. The duties of the homeroom and subject teachers in a guidance program be thoroughly indicated and understood.

7. A class counselor be appointed in every school. In schools having fewer than five teachers, the principal might serve in this capacity.

8. A community council be established, the duties of which were elaborated in the report of this study.

THE NEEDS AND PROBLEMS OF GIRARD COLLEGE GRADUATES

(Publication No. 1539)*

James D. White, Ph. D.
University of Pennsylvania, 1949

This study is an investigation of the experienced, or felt, needs and problems as reported by boys who are graduates of a particular type of school, Girard College, a secondary boarding school, where they have spent, under conditions of group living and in an environment containing many points of uniformity affecting all students, eight to twelve of their formative years.

Seven hundred and fifteen graduates, 153 of them having attended the Girard Post High School for a year after high school graduation, reported their experienced needs and problems in answers to items of a questionnaire. These respondents were members of fifteen half-yearly classes from January 1936 to January 1943, inclusive.

The personal, social, and occupational needs and problems of the graduates were determined from their answers to the questions. The relative troublesomeness of these needs and problems was ascertained by a composite ranking of 27 needs and problems on the basis of the sum of the percentages of the graduates' responses of "Great" and "Some" for each question.

The significant needs and problems of various groups of graduates were discovered by applying the chi-square test of independence to tables showing the relationship between factors existing in their in-school life, used to classify groups of graduates, and their needs and problems after graduation. To identify the factors, personal and environmental, information was secured from the school records and from the respondents' answers to certain questions on the questionnaire.

From the composite ranking of 27 needs and problems (10 social, 10 personal, and 7 occupational), arranged by the sum of the percentages of "Great need" and "Some need," the experienced needs and problems of these youth may be ranked in order of intensity of concern as: First, social; second, personal; third, occupational.

Seven of the 10 social needs and problems studied ranked in the highest third (9 needs and problems) of the composite list, 2 in

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the middle third, and one in the lowest third. Five of the 10 personal needs and problems ranked in the middle third of the list, one in the highest third, and 4 in the lowest third. Four of the 7 occupational needs and problems ranked in the lowest third of the composite list, 2 in the middle third, and one in the highest third. The need or problem checked by the highest percentage of graduates as being of serious concern was an occupational need, knowledge of occupational fields, and the one rated by the smallest percentage as of concern to them was also an occupational need, securing a regular job.

Principal needs and problems by type, reported as vexatious by highest percentages of respondents were: Social; how to act when with girls, getting acquainted with girls, and need for sex information. Personal; need for knowledge about buying, securing further schooling, and relying on self. Occupational; need for knowledge about occupational fields, finding life work, and disagreements with boss.

There were 326 tables of relationship drawn up between factors in the respondents' life while in school (which were used to identify groups of graduates) and their needs and problems when they were graduated. The chi-square test was applied to 209 of these tables and a significant relationship between the variables, on the 5 per cent, 2 per cent, or one per cent level of confidence, was found in 70 tables. Of these 70 significant relationships, 62 indicated that graduates who lacked something in school (such as participation in school activities, or association with girls) had certain needs and problems to a greater extent than those who had not lacked those things, while 8 relationships indicated that even though the respondents lacked certain experiences while in school, nevertheless they did not have certain needs and problems to as great an extent as those who had been better favored.

Generally speaking, of the groups of graduates studied, those who had not associated with girls while in school, who had not left the school grounds for the summer vacations, who had not participated in school activities, who were below the mean of academic teachers' marks, below the mean in intelligence quotient, and who had not left the school grounds on Saturdays and Sundays, had the largest numbers of needs and problems associated with them to a significant extent when they were graduated and left the school environment.

EDUCATION AND PSYCHOLOGY

FACILITATING LEARNING THROUGH EMPHASIS ON MEETING CHILDREN'S BASIC EMOTIONAL NEEDS: AN IN-SERVICE TRAINING PROGRAM

(Publication No. 1485)*

Anna Porter Burrell, Ph. D.
New York University, 1949

Statement of the Problem

In almost every elementary classroom are children who are having difficulty in learning or in finding out how to get along with people. The purpose of this study is to determine the value of the hypothesis that the learning of such pupils can be facilitated if emphasis is placed upon meeting their emotional needs rather than by applying special drills or special remedial work.

Design of the Project

The general design of the experiment was a "before" and "after" type of procedure and a method of working in the interim through an in-service program with the teachers in the experimental school. They in turn worked with their students, concentrating attention on selected pupils in their groups. The project was begun on February 18, 1948 and consisted of six teachers and their Fourth, Fifth and Sixth grade classes. Public School 67 in Brooklyn, New York, was the experimental school and Public School 54, in the same district, the comparison school. From each class the teacher selected five students who gave evidence of extreme needs and learning difficulties which could be handled within the classroom.

Evidence was gathered to see if, as we tried to meet the needs of the experimental children, their learning would be facilitated. The major hypothesis of the study was tested by comparing the changes in the various measures which occurred in the experimental and comparison groups. Statistic "t" and x^2 , as well as anecdotal evidence provided indications of changes in achievement, intelligence and social acceptability.

Motion pictures, recordings, readings check lists, and objective pictures of needs were employed in an effort to train the experimental teachers. The teachers of the comparison group did not participate in the training program.

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Conclusions

Summarizing the test data along with the teachers' judgments of improvement, the following conclusions are drawn with reference to the experimental selects:

1. Social acceptability was widened. The girls of the group showed significant gains.
2. Intelligence ratings increased in nine of the fourteen cases.
3. Achievement increased significantly in every group.
4. Classwork improved in every case.
5. Desirable behavioral manifestations were evidenced.
6. Work habits were bettered.
7. Personal habits improved.
8. Interest in school and school work increased.
9. Standards became more flexible; classroom atmospheres became permissive.
10. Psychosomatic symptoms decreased.
11. Speech defects lessened and in some instances disappeared.
12. Teachers' attitudes were improved.
13. Parents' attitudes in some instances were improved.
14. Children were happier.

Implications of the Study for Education

In so far as teachers are concerned this field is a comparatively new one. Consequently this study presents implications for programs in teacher education at both in-service and pre-service levels. Furthermore, the study has implications for many other people dealing with children, parents, clergymen, law enforcement officials, guidance counselors, doctors and nurses. For as the child's emotional needs are met in school and outside, so will his learning be facilitated. It is important that many sources be used to clarify the Needs Theory, therefore, another implication of this study is for the development of more and better resource materials in this field. Research in the area of the Needs Theory and its relationship to Personality development and learning of the child is needed also, and if wisely handled, carefully studied and scientifically approached, it might enable us to come to understand some of the requirements of growth and development of children. With such a factual foundation we might be in a position to point out the necessary modifications if growth is to be nurtured.

AN EXPLORATORY STUDY OF THE EFFECTS OF AN
IN-SERVICE EDUCATION PROGRAM ON CHILDREN
WITH SYMPTOMS OF PSYCHOSOMATIC ILLNESS

(Publication No. 1487)*

Robert S. Fleming, Ed.D.
New York University, 1949

The purpose of this study was to develop an in-service program of teacher education in which teachers became sensitive to the emotional needs of twenty-six children who had psychosomatic difficulties. Such a program made possible the testing of the hypothesis that as teachers try to meet the emotional needs of children, psychosomatic symptoms tend to become less intense in nature and less frequent in appearance. A secondary consequence was to be increased school attendance and a third consequence was to be the tendency of the children to become less aggressive and to show greater participation in school activities.

The evolution of the psychosomatic concept was described and frequent reference made to the effect of such illness upon learning.

Careful attention was given to the design of this study and provision was made for the developmental nature of procedures and materials.

The in-service program consisted of 20 group meetings, 157 individual conferences, 179 classroom observations, the showing of 11 motion picture films, and 25 conferences with parents. Through the use of a series of Human Relations films, teachers became sensitive to emotional needs.

Through observations, and the use of needs tests, unfulfilled needs were identified for each child in the study.

A plan for working with each child was developed which consisted of consistent and continuous efforts of the teacher to work with each child to supply his needs.

There were twenty-six psychosomatic children from nine different classes in the experimental groups. Twelve psychosomatic children from three classes made up a comparison group. The investigator spent his full time in the school during the five months' period. He was available to work with teachers in the experimental group at all times.

Physical examinations of all children in the experimental and comparison groups were conducted by a medical doctor at the

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beginning of the semester, and again at the close of the semester. In the experimental group the doctor indicated that twenty-five (93.1 per cent) of the twenty-six children had shown improvement while six (50.0 per cent) of the comparison group had shown improvement.

There was a reduction in frequency of symptoms in the experimental group, but not in the comparison group.

An analysis of attendance records shows that in the experimental group there was a 49.7 per cent gain in attendance while in the comparison group there was a 40.9 per cent loss in attendance.

All parents were interviewed by the school nurse. In both groups parents tended to note improvement. Teachers of the experimental group, however, described greater improvement than did the comparison teachers.

The assumption was made that significant progress could be made with psychosomatic children if both parents and teachers attempted to meet the child's emotional needs. Nine parents made up a group in the experimental study thought of as "parent plus teacher" group. The children whose parents and teachers worked together showed greater improvement than did other children in the study.

It was possible to compare results of achievement tests given all children in November with results of the same test given in June. It was found that children in the experimental group made greater academic progress than did other children in their rooms. This indicates that as teachers emphasize the emotional adjustment of children, it is not done with a loss in academic achievement.

From the data collected it is evident that it is possible to develop an in-service program which will help teachers become sensitive to emotional needs. As teachers attempt to meet these needs of children psychosomatic symptoms tend to diminish in frequency and intensity. Likewise school attendance is improved. When parents and teachers work cooperatively greater improvement seems to emerge. As children improve physically, there is greater participation in school and community activities.

THE RELATIONSHIP BETWEEN INTEREST LEVEL AND
THE DISCREPANCY BETWEEN SCHOLASTIC APTITUDE
AND ACADEMIC ACHIEVEMENT

(Publication No. 1520)*

Curtis B. Merritt, Ph.D.
University of Michigan, 1950

In this study a relationship was hypothesized between (1) interest level, expressed as the mean standard score of various combinations of occupational scales from the Strong Vocational Interest Blank for Men, and (2) the discrepancy between scholastic aptitude and academic achievement. The American Council on Education Psychological Examination was used to measure scholastic aptitude and grade-point ratios were the criteria of academic achievement. The subjects were 207 male students in the College of Literature, Science, and the Arts at the University of Michigan.

The Pearson product-moment correlation method was used to discover the extent of the relationships among the variables studied. Eight measures of interest level were used. Six of these were measures of general interest level and included combinations of both high and low ratings on scales of the Strong blank. The measure of science interest level was the mean standard score of the occupations making up Strong's occupational Group II. The index of verbal interest level was a similar measure derived from Strong's occupational Group X.

On the basis of the findings it was concluded that: (1) there is no significant relationship between any measure of general interest level and the discrepancy between scholastic aptitude and academic achievement, (2) there is a significant relationship between science interest level and the discrepancy between scholastic aptitude and academic achievement in physics, chemistry, or mathematics, and (3) there is no significant relationship between verbal interest level and the discrepancy between scholastic aptitude and academic achievement in related verbally oriented course work.

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A STUDY OF CLOTHING AND APPEARANCE PROBLEMS IN
RELATION TO SOME ASPECTS OF PERSONALITY AND
SOME CULTURAL PATTERNS IN A GROUP OF
COLLEGE FRESHMAN GIRLS

(Publication No. 1497)*

Dorothy L. Stepat, Ph.D.
New York University, 1949

The importance of clothing and personal appearance to the adolescent girl is generally recognized. In the light of the theories about responses to feelings of being well-dressed, concern about personal appearance and clothing would bear some relationship to personal adjustment. The purpose of this study was to determine whether or not there are any significant relationships between concern about clothing and personal appearance and some aspects of personality and some cultural patterns in a group of 328 girls registered in the second half of the freshman year at Hunter College, a non-resident, municipal college in New York City.

Two contributions to the related literature are most important. A study by Silverman¹ showed some significant meanings of clothing for adolescent girls. A challenging article by Hartmann² indicates needs for broadening perspectives of clothing research and cites the need for contributions from home economics education in this area to personality development.

A Clothing and Appearance Problem Check List, composed of 102 items with five possible responses to each, was developed to obtain some measure of the varying degrees of concern in this area and created with the idea of further usefulness in teaching college clothing courses.

A Personal Data Form was designed to obtain information related to social and recreational activities, cultural interests, travel and work experience and creative activities. This Form and the Clothing Check List were administered to all the subjects.

* Microfilm copy of complete manuscript of 181 pages, \$2.26.
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1. Sylvia S. Silverman, Clothing and Appearance, Their Psychological Meaning for Teen-Age Girls. Bureau of Publications, Teachers College, Columbia University, 1945.
2. George W. Hartmann, "Clothing: Personal Problem and Social Issue," Journal of Home Economics, 41:295-298, June, 1949.

The study group was divided into thirds for administration of three personality rating devices: The Minnesota Personality Scale, The Washburne Social-Adjustment Inventory, and The Mooney Problem Check List. Personality differences indicated by these three devices were studied in relation to varying degrees of concern indicated on the Clothing Check List. In addition, subjects in the upper and lower deciles of the distribution of weighted scores on the Clothing Check List were interviewed by the investigator and for each subject interviewed, comments and opinions from at least one other instructor were obtained.

Data were analyzed by computing certain coefficients of correlation, by comparison of upper and lower quartile groups on the distribution of scores on the Clothing Check List and by comparison of the two groups of subjects interviewed. The evidence collected points to the general conclusion that subjects who showed greater concern about clothing and appearance gave far more evidence of personal and social maladjustments. These subjects also showed a narrower range of interests, activities and experiences on the Personal Data Form. Striking differences were found when the upper and lower quartile groups were compared with each other and with the published norms for the devices used, particularly in areas where family relations, emotional stability and social adjustment were involved. Analysis of the interviews supported the conclusions rather dramatically.

Although causal factors in the relationships were not investigated, evidence seems to warrant the interpretation that interaction of several factors creating an unhealthy emotional setting produced situations in which problems related to clothing and appearance were intensified and magnified to undue proportions.

Results of the study indicate needs for individualized approaches to teaching in this area and for extension of home economics education to meet needs of all students. Most evident is the need for seeing each individual in terms of his own particular situation and for studying relationships among many facets of the personality as a basis for personality development.

Need for further research in this area is indicated particularly with respect to social and emotional adjustment and family relations, and to causal factors which may be involved in the relationships investigated.

ENGINEERING

SOME STUDIES OF ELECTRICAL OSCILLATIONS IN A MERCURY VAPOR GAS DISCHARGE AT LOW PRESSURE

(Publication No. 1546)*

John Harold Bryant, Ph.D.
University of Illinois, 1949

A study was made of oscillations in the decimeter wavelength range in a low pressure (1 micron) mercury vapor gas discharge.

The oscillator studied is of the type described by G. Wehner. It consists of two cathodes (placed opposite each other) and an anode. The lower cathode (cathode No. 1) is the source of a stream of electrons. It draws electron current from a highly ionized region below, consisting of a fixed spot mercury pool ignitron. Electrons pass through a circular gridded area in cathode No. 1 and are accelerated in cathode No. 1 dark space to plasma (or anode) potential. They traverse the plasma at practically uniform velocity and enter cathode No. 2 dark space, are reflected and traverse the plasma again. There may be several traversals for individual electrons since the mean free path is long compared to electrode spacing. This type of motion furnishes energy to the oscillations. The ultimate interception of these electrons by gas molecules maintains the high degree of ionization required.

To study the mechanism of oscillation, the d-c potential distribution in the discharge was determined. The method used consisted in shooting a fine, 1500 to 2500 volt test beam of electrons transversely through the discharge. This test beam appears as a spot on a fluorescent screen beyond. The deflection of the spot is a measure of potential gradient in the discharge at the point where the beam crossed. The oscillator electrode assembly is moved axially by means of a sliding vacuum seal and a micrometer drive. The deflection of the test beam is measured as a function of electrode position. From this is determined the potential gradient distribution. Potential distribution is obtained by an integration.

No difference for potential distribution between oscillating and non-oscillating conditions was found. There was no evidence of striations in the discharge. Potential gradient was practically a linear function of distance in the cathode dark spaces; being maximum at the cathodes and zero at the plasma boundaries.

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With 160 volts anode potential the maximum potential gradient was 2,500 volts/cm.

Resolution of potential gradient measurement was 50 volts/cm. The test beam did not show the presence of the r-f fields; so magnitude of the r-f fields is less than 50 volts/cm. Further studies of the r-f fields, using small r-f probes inserted into the discharge, showed: 1) r-f energy appears throughout the plasma (positive column of the discharge), and 2) field components present are H_ϕ , E_z and probably E_ρ . Tests using variable spacing between cathodes showed modes in the axial direction. Also, there is a minimum diameter of discharge for which oscillations may be obtained.

A theory was developed for the mechanism of oscillation. The plasma is considered to be a cylindrical dielectric resonator. It is bounded on top and bottom by cathode dark spaces, and radially by a region of low index of refraction (compared to the plasma). At frequencies considered here, the plasma is a dispersive medium. Those r-f waves having a velocity of propagation near the velocity of the d-c beam of electrons traversing the plasma (with velocity corresponding to anode potential) can extract energy from the beam and grow in amplitude. These amplified waves are reflected at the boundaries; setting up standing waves in the plasma. Frequency of oscillation is determined by anode potential, V_A , spacing between cathodes, a , and diameter of the discharge. If the discharge diameter is large compared to cut-off diameter, the frequency of oscillation is given by:

$$af = 5.93 \times 10^7 \frac{m}{2} V_A^{\frac{1}{2}} + 9.88 \times 10^6 V_A^{\frac{3}{4}}$$

EXPERIMENTAL DETERMINATION OF STRAINS AND STRESSES THROUGHOUT REINFORCED CONCRETE BEAMS UNDER SHORT TIME LOADING

(Publication No. 1510)*

Ala Eldin Fatin, Sc.D.
University of Michigan, 1950

The measurement of the strain inside the concrete was the dream of several investigators in the last few years all over the world. It was thus the objective of this research to develop a technique for measuring the strain inside the concrete and to use this

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technique in getting the distribution of strains and stresses in reinforced concrete beams. A suitable strain capsule was perfected for this purpose by mounting two tiny electric strain gages on a celluloid sheet supplied with two copper lugs and then protecting these gages by rubber cement. These strain capsules were used successfully in some pilot tests and then fifty of them were used to measure the strain inside standard concrete cylinders as well as inside two reinforced concrete beams; Beam #1 reinforced in the tension side only and Beam #2 reinforced in compression as well as in tension. Strain gages were also mounted on the steel bars and on the surface of the beams to record the strains under pure bending.

The general conclusions of this research were that the standard concrete cylinders should not be considered as an accurate means of getting the modulus of elasticity of concrete or even its breaking stress. The traditional assumption that "a plane before bending remains plane after bending" was proved experimentally for the first time to be correct and the distribution of stresses under short time loading, and with constant bending moment, was proved to be linear within a reasonable limit of the experimental errors to be expected with such a nonhomogeneous material. The concrete below the neutral axis carried 15% of the tensile forces, the modulus of elasticity that satisfied the conditions of equilibrium was 20% smaller than that recommended by the American Concrete Institute Standards and the compression reinforcements in shallow beams neither added to the strength of such beams nor reduced the stresses in the tension reinforcements.

A STUDY OF CERTAIN FERROMAGNETIC ALLOYS IN THE
SYSTEMS COPPER-MANGANESE-INDIUM AND
COPPER-MANGANESE-GALLIUM

(Publication No. 1538)*

Frederick Arthur Hames, Ph. D.
University of Missouri, 1948

The ferromagnetic beta phases in the systems copper-manganese-aluminum and copper-manganese-tin have an ordered body-centered cubic structure. The beta phases in these ternary systems are obtained by adding manganese to the beta phases in the binary systems copper-aluminum and copper-tin.

In view of the chemical similarities of aluminum, tin, indium,

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and gallium, and the existence of beta phases in the binary systems copper-indium and copper-gallium, it may be suspected that ferromagnetic beta phases exist in the ternary systems copper-manganese-indium and copper-manganese-gallium. In the present investigation, these systems were investigated for ferromagnetic alloys by magnetometric, microscopic, and X-ray methods.

A ferromagnetic copper-manganese-indium alloy containing 42.5 per cent copper, 18.0 per cent manganese, and 39.5 per cent indium (per cent by weight), corresponding to atomic proportions $Cu_{2.00}Mn_{0.952}In_{1.00}$, was prepared. Quenched from $500^{\circ}\text{C}.$, this alloy had a saturation magnetization about equal to that of nickel. The structure of the quenched alloy was ordered body-centered cubic with $a_0 = 6.206 \text{ \AA}$.

A copper-manganese-gallium alloy containing 49.5 per cent copper, 21.6 per cent manganese, and 28.9 per cent gallium (per cent by weight), corresponding to atomic proportions $Cu_{1.97}Mn_{1.00}Ga_{1.05}$, was prepared. This alloy was feebly magnetic after quenching from temperatures in the range $500^{\circ}\text{C}.$ to $750^{\circ}\text{C}.$, and consisted of more than one phase. Aging of this alloy at $100^{\circ}\text{C}.$ and $200^{\circ}\text{C}.$ following quenching for times ranging up to 110 hours had little effect on magnetic saturation moment. Highest saturation moment, amounting to about 5 per cent of that of nickel, was shown by a specimen quenched from $650^{\circ}\text{C}.$ and then aged at $100^{\circ}\text{C}.$ for 110 hours.

Copper-manganese-gallium alloys containing 62.3 per cent copper, 13.0 per cent manganese, and 24.7 per cent gallium; and 57.8 per cent copper, 16.0 per cent manganese, and 26.2 per cent gallium (all weight per cent) were ferromagnetic after quenching from $750^{\circ}\text{C}.$ Both alloys showed a martensitic structure after quenching from $750^{\circ}\text{C}.$

The alloy containing 57.8 per cent copper, 16.0 per cent manganese, and 26.2 per cent gallium had a room temperature magnetic saturation moment of about 70 per cent of that of nickel after quenching from $750^{\circ}\text{C}.$ This alloy became non-magnetic after slow cooling from $750^{\circ}\text{C}.$, presumably due to transformation into non-magnetic products, a transformation being indicated under the microscope. Aging of this alloy at $100^{\circ}\text{C}.$ and $200^{\circ}\text{C}.$ caused a reduction in saturation moment, but no transformation was apparent under the microscope. Reduction in saturation moment took place more rapidly at $200^{\circ}\text{C}.$ than at $100^{\circ}\text{C}.$

X-ray powder diffraction patterns were taken of the latter two alloys quenched from $750^{\circ}\text{C}.$, but an interpretation of the patterns was not found. In particular, no combination of lines could be found reconcilable with the lines to be expected for a body-centered cubic structure, simple or ordered. The occurrence of martensitic structures in quenched alloys suggests that they are constituted of a

transition phase derived from the beta phase of the system copper-manganese-gallium, the beta phase being stable at high temperatures but not retained by quenching. Support for this view is also found in the behavior of copper-gallium alloys, which are known to develop martensitic structures on quenching from the beta range, as do also the beta copper-aluminum alloys. It should be possible to clarify the structure of the ferromagnetic copper-manganese-gallium alloys with the aid of high-temperature X-ray diffraction data.

RESONANT CAVITY STUDIES OF A WIDE RANGE TUNABLE KLYSTRON

(Publication No. 1551)*

Han Chuan Hu, Ph.D.
University of Illinois, 1949

This work is divided into four main divisions; (1) geometries of wide range cavity, (2) determination of shunt resistance, (3) output coupling, (4) mode interference studies.

Under the first division it was pointed out that for the coverage of 2.24 - 3.8 cm. mode interferences in the main guide and plunger crevice limits the tuning range to less than 2 to 1 and an outside diameter of about half inch. A new approach to the plunger crevice interference is discussed which will allow an outside diameter of 0.866".

A ridge waveguide tuner, owing to the greater separation between the cut off wave lengths of the dominant and higher modes, can easily allow a 2 to 1 tuning range. The proposed dimensions of a 2 - 4 cm. tuner is presented.

In part two an approximate method which estimates the order of magnitude of shunt resistance is presented. This method involves the measurement of Q and tuning curve and the assumption of an equivalent circuit. Measured data are presented from 3.1 to 3.8 cm. Owing to the lack of signal source below 3 cm., the considerations of a scaled model to extend the above method to below 3 cm. is discussed.

A better method is through the analogue data of network analyzer. The principles to do quantitative calculations with the network data are discussed. The important steps are presented of the

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numerical computation of two sets of network data taken through the courtesy of Electronics Research Laboratory, Stanford University. One case is for a cavity without ceramic and the other is for one with a ceramic barrier between the vacuum and air sections of the cavity.

Part three discusses the problem of a coupling loop in a wide range $\frac{3\lambda}{4}$ coaxial cavity. An expression is derived with which the loop size can be computed to couple a certain desired impedance. This expression also reveals the optimum location of the loop for the minimum fluctuation of coupling in a wide range tunable cavity.

Under the fourth division the mode interference is considered. Experimental methods are suggested to investigate the increase of power loss and discontinuity of tuning at a mode crossing. By employing the normal mode theories by J. C. Slater, expressions were obtained which show the nature of two mode coupling through the surface resistance of walls, the introduction of an extraneous wire and the deformation of cavity wall. A practical way to create desired mode coupling is discussed by virtue of cutting slots on walls normal to the direction in which the currents of the two modes cancel. Illustrations are made for the degeneracy of TE₁₁₂ and TE₃₁₁ in a cylindrical cavity with D = 4.74 cm., L = 3.41 cm. and $\lambda = 3.14$ cm. Four plots are made of the slot patterns for $U_1/U_3 = 2/1$, $1/1$, $1/1.867$ and $1/3$, where U_1 and U_3 are the energy storage of TE₁₁₂ and TE₃₁₁ respectively.

THE INPUT IMPEDANCE OF A RECTANGULAR APERTURE ANTENNA

(Publication No. 1556)*

Cleve Crumby Nash, Jr., Ph.D.
University of Illinois, 1949

Approximate formulas are derived for the input impedance of an antenna consisting of a center fed rectangular aperture in an infinite conducting plane, based on an assumed sinusoidal voltage distribution along the aperture.

The method employed is analogous to the well known "induced e.m.f." method, and yields for the total radiated complex power a

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series expansion in terms of the aperture width, with coefficients depending on the aperture length.

For apertures less than one half wavelength long, the input impedance is obtained directly from the calculated complex power and the assumed current distribution. For longer apertures a transmission line analogy is used, the aperture being considered as a nonuniform transmission line for magnetic currents, and the parameters of a magnetic transmission line of geometry suited to the problem are obtained. Carson's method is used to calculate the input impedance of a nonuniform magnetic transmission line terminated by a load impedance such that the total complex power flow from the line, both into the load and "laterally" into space, equals the complex power flow calculated for a given aperture length.

It is pointed out that this procedure may be applied to ordinary antennas, and in particular leads to a method of calculation of the input impedance of cylindrical antennas directly from their so-called "loop radiation impedance" which does not require an empirical correction on the antenna length.

Experimental evidence is presented which indicates that the calculated input impedance is fairly accurate for narrow apertures even when the aperture is somewhat more than one wavelength long. The calculated values are progressively worse approximations as the aperture width increases.

It is pointed out that the radiation resistance of a half wave wire antenna calculated from an assumed sinusoidal distribution (73 ohms) does not agree with experimental evidence. Hallen's approximate formula gives good agreement with the measured value of about 90 ohms.

THE RECRYSTALLIZATION AND COALESCENCE OF COLD-ROLLED NICKEL

(Publication No. 1563)*

Glen William Wensch, Ph. D.
University of Illinois, 1949

Introduction

This investigation was a study of the grain sizes produced by the recrystallization and coalescence of nickel which had been subjected to 20, 40, and 60 per cent deformation through cold rolling and had been isothermally annealed with time as the variant. The

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progress of these phenomena with time was measured after an isothermal anneal for different periods of time. From the data isothermal recrystallization curves were drawn and the results analyzed. Furthermore the process of recrystallization was examined from a phenomenological thermodynamic point of view, from which a heat of activation for recrystallization was found.

Experimental

Nickel which had been deformed 20, 40, and 60 per cent through cold rolling was isothermally annealed at 650, 700, 750, and 800 degrees Centigrade until recrystallization was found complete. The recrystallized grain size was determined.

Nickel which had been fully recrystallized was isothermally annealed at 800, 900, 1,000, and 1,093 degrees Centigrade for 2.5 to 25,000 minutes. The grain size after each annealing period was determined.

Results

The experimental data obtained in this investigation indicate that:

1. Nickel with a grain size of 0.432 mm. which had been cold rolled 20, 40, and 60 per cent formed a duplex grain microstructure after a recrystallization anneal. The duplex grain structure resulted from prior inelastic deformation gradients which existed throughout each grain and from grain to grain.
2. Nickel with a grain size of 0.0227 mm. which had been cold rolled 20, 40, and 60 per cent and subsequently isothermally annealed at 650, 700, 750, and 800 degrees Centigrade produced a recrystallized grain size which was dependent only upon the degree of prior deformation.
3. The heat of activation for recrystallization decreases with increases in inelastic deformation prior to annealing. The heats of activation were 75.8, 73.3, and 69.5 K cal/mole for deformations of 20, 40 and 60 per cent respectively.
4. An equilibrium grain size was apparently obtained by all specimens demonstrating normal grain growth. The equilibrium grain size increases with increasing annealing temperature.
5. The heat of activation for grain growth of nickel was found to be 85.5 K cal/mole.
6. The heat of activation for grain growth may approximate the heat of activation for self-diffusion as found from radioactive tracer studies.
7. The diffusion constant for self-diffusion as found from this grain growth study is

$$\frac{-85,500}{RT}$$

D = 1.10 (assuming Conclusion No. 6 to be correct).

Acknowledgment

The writer wishes to express his indebtedness to all members of the Department of Mining and Metallurgical Engineering at the University of Illinois.

Special acknowledgment is made to Professor Walker, supervisor of this investigation whose personal interest and excellent guidance were a source of comfort when unforeseen difficulties arose in this problem.

A deep feeling of gratitude is expressed to the International Nickel Company whose Fellowship made this research possible. Doctor Mudge of this company extended special services which are appreciated by the writer.

ENGINEERING MECHANICS

TRANSVERSE VIBRATION OF BEAMS

(Publication No. 1514)*

Robert L. Hess, Ph. D.
University of Michigan, 1950

Summary

Beams of variable and constant cross section are considered. The response of these beams to arbitrary vertical loading is calculated.

In the case of uniform beams, a general method of solution is presented which allows us to find the form of solution entirely without explicit use of the conditions of end restraint. Thus, it is possible to branch out from this solution quickly to the particular solution for any condition of end restraint. This is done for the following cases:

Free	-	Free Beam
Hinged	-	Free Beam
Built In	-	Free Beam
Hinged	-	Hinged Beam
Built In	-	Hinged Beam
Built In	-	Built In Beam

The general differential equation for the uniform beam is

$$1) \left[EI_1 \frac{\partial^4 x_2}{\partial x_1^4} - I_2 \frac{\partial^4 x_2}{\partial x_1^2 t^2} \right] + \left[1 + \frac{I_2}{KAG} \frac{\partial^2}{\partial t^2} - \frac{EI_1}{KAG} \frac{\partial^2}{\partial x_1^2} \right] \left[Bx_2 + C \frac{\partial x_2}{\partial t} + \mu \frac{\partial^2 x_2}{\partial t^2} - P(x_1 t) \right] = 0,$$

where EI_1 is the bending rigidity; KAG , the shear rigidity; I_2 , the mass moment of inertia per unit length; B , the buoyant force per unit length per unit displacement; C , the damping force per unit

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length per unit velocity; and μ , the mass per unit length. The general solution of Equation (1) is written

$$2) \quad x_2 = \frac{1}{H} \int_{-\frac{1}{2}}^{+\frac{1}{2}} dx'_1 \int_0^t P(x'_1, t') x_2 H dt' ,$$

where $P(x'_1, t')$ is the description of the load and $x_2 H$ is given by

$$3) \quad x_2 H = H \sum_{n=1}^{\infty} \left\{ \left[\frac{[A_{i\beta} g_i(x'_1)]_n}{\mu w_n \int_{-\frac{1}{2}}^{+\frac{1}{2}} [A_{i\beta} g_i]^2 dx'_1} \right] \left[A_{i\beta} g_i \right] \left[\begin{matrix} -a_n(t-t') \\ \varphi \sin w_n(t-t') \end{matrix} \right] \right\} s_n = -a_n + i w_n$$

where $g_1 = \sinh \theta x_1$, $g_2 = \cosh \theta x_1$, $g_3 = \sinh \theta x_1$, $g_4 = \cosh \theta x_1$, and $A_{i\beta}$ is the cofactor of a_{ij} for $\beta = \text{any } j$, and where $|a_{ij}| = 0$ is the frequency equation which has the roots $s_n = -a_n + i w_n$.

The variable cross section beam is handled similarly, except that the shape factor $A_{i\beta} g_i$ is determined graphically.

NATURAL MODES OF VIBRATION OF TWISTED UNSYMMETRICAL CANTILEVER BEAMS INCLUDING CENTRIFUGAL FORCE EFFECTS

(Publication No. 1562)*

Stanley Irwin Weiss, Ph. D.
University of Illinois, 1949

This paper presents an analysis for the determination of the natural mode of vibration of twisted cantilever beams with arbitrary cross-sectional variation. Extension to include the effects of centrifugal force is made. The theory is developed along lines similar to those established by Myklestad for untwisted beams. In the presented work, bending in two perpendicular directions and torsion are taken into account. The method is numerically exact and is considerably more rapid than those using an integral equation approach.

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Primary assumptions are those implied by considering only small deflections, i.e., linearity of all relationships involving deflection, slope and angle of torsion.

The beam is assumed weightless, but made up of a finite number of masses and inertias distributed at discrete points. The section between two consecutive masses is considered untwisted within itself, with abrupt changes due to twist taking place at each station. Each section will have the twist angle made by its major axis with one of the fixed bending coordinate axes, the latter being parallel to themselves at every point along the undeflected elastic axis. This angle can be taken as the mean angle of twist for the beam section considered. The greater the number of sections taken, the greater will be the accuracy in determining the vibration modes.

Physically the method involves shaking the beam with a harmonic bending moment in one of the coordinate planes at the base so that the deflection in that coordinate at the tip is unity. Deflection in the other coordinate, slopes, and torsion at this point will be determined by the conditions at the base. For forced vibration with finite amplitude, the base-slope in the plane of the shaking moment will be zero every time the forced frequency equals a natural frequency. Plotting a curve of this base-slope vs. frequency of shaking force will yield by zero intersections with the frequency axis the values of natural frequencies.

Via linear expressions relating amplitudes at the tip to those at other points along the beam, it is possible, for any assumed frequency, to calculate amplitudes from tip base-ward until base amplitudes are determined as functions of the tip values. The latter may be found by solving four simultaneous equations involving four of the base restraints, deflection in two directions, slope in one, and torsion angle, equal zero. The second slope is the quantity plotted. A tabular scheme for the solution is presented.

The method is applied to determine the first two modes of a stationary turbine blade, and the first mode of the same blade rotating at 1800 rpm on an 80 inch diameter disk. Values obtained in the first case are compared with test values for the blade natural frequencies and also with frequencies obtained taking the motion approximated to be bending of the blade about its minimum axis of inertia, disregarding twist. The difference between the method of this paper and the approximate solution was small for the first mode, but became considerable (18%) for the second. For the rotating blade, the approximate solution was 10% higher than that obtained by the presented analysis. Mode shapes were plotted, and indicated that the effect of torsion was more pronounced both in the higher mode of the stationary blade, and with the inclusion of centrifugal force.

G E O L O G Y

GEOLOGY OF THE SOUTHWEST QUARTER OF THE JACKSON QUADRANGLE, WYOMING

(Publication No. 1503)*

Ruth Frances Bastanchury Boeckerman, Ph. D.
University of Michigan, 1950

The southwestern quarter of the Jackson Quadrangle lies just east of the Idaho-Wyoming state line, about 65 miles south of Yellowstone National Park. It includes the southern end of the Snake River Range, northern end of the Salt River Range, and all of Middle Ridge, and is drained by the Snake, Salt and Greys rivers. About 6,000 feet of Paleozoic and 7,900 feet of Mesozoic sediments are exposed in the area and represent every period with the possible exception of the Silurian. Thirty stratigraphic sections were measured by H. R. Wanless, the writer, and others. Formation names and stratigraphic boundaries proposed by Wanless are used in the areal mapping.

During the upper Paleocene phase of the Laramide orogeny, the Paleozoic and Mesozoic strata were cast into a series of great thrust sheets which rode eastward over one another in imbricate fashion. Ten thrust sheets are described, from west to east, the Stewart, Star, Blowout, Needle, Ferry, St. Johns, Absaroka, Murphey, Firetrail, and Darby thrust sheets. Within them, the Bradley Mountain syncline, Firetrail anticline, Middle Ridge anticline and syncline, and Little Greys anticline and syncline are described. Two later phases of orogeny, one in post-Eocene but pre-Miocene time and one in late Eocene, affected areas to the east and northeast.

The oldest erosion surface still remaining, although in remnants, is the Union Pass. It is believed to have been eroded before late Miocene block faulting, when it was broken by the Long Spring, Grand Valley, Snake River, and perhaps other high angle normal faults, while on the downthrown blocks the fanglomerates and tuffs of the Camp Davis conglomerate were deposited, filling the fault troughs and lapping up over the scarps in many places. The Black Rock surface was eroded about 1,000 feet below the Union Pass surface. The present regional drainage system had been established by this time, and four post-Black Rock erosion cycles are recorded in the valley of the Snake River.

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MIDDLE DEVONIAN SANDSTONES OF THE
MICHIGAN BASIN

(Publication No. 1509)*

Richard L. Enyert, Ph. D.
University of Michigan, 1950

The Detroit River group of lower Middle Devonian age is divided into two distinct units. The lower unit is largely limestone and dolomite and the upper unit is dolomite and evaporite deposits. The lower part includes the Sylvania and Filer sandstones. The Sylvania sandstone, which is the basal member, crops out in southeastern Michigan and northwestern Ohio, and extends in the subsurface through central and western Michigan. The Filer sandstone member does not crop out, but is present in the subsurface in central and western Michigan. It is 75 to 140 feet below the top of the carbonate rocks, which varies from 20 to 350 feet in thickness. Erosion probably followed deposition of the carbonate sequence, which is overlain by the evaporite unit. The "Detroit River evaporite" section largely consisting of dolomite, anhydrite, gypsum, and rock salt, does not crop out. A sandstone, named the Richfield, occurs at the base of the unit in central and western Michigan. The evaporite sequence may not be of Detroit River age.

The Sylvania sandstone grades into the overlying carbonate rocks and unconformably overlies the upper Silurian Bass Island or lower Middle Devonian Bois Blanc rocks. On the basis of heavy mineral content and size of the sand grains, the St. Peter sandstone of Lower Ordovician age in the Wisconsin Highland area to the northwest is considered to be the chief source of the sandstones studied. Although they were probably deposited in a marine environment, they may have been transported by both wind and water.

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H I S T O R Y

THE ATTITUDE OF KANSAS TOWARD RECONSTRUCTION OF THE SOUTH

(Publication No. 1543)*

Martha Belle Caldwell, Ph.D.
University of Kansas, 1933

The purpose of this study is to investigate the reactions of the people of Kansas toward reconstruction in the south after the Civil War. Numerous studies have been made of southern states during this period, but little attention has been given to the northern states. Was the Radical Republican program, which was imposed upon the south, approved by the northern states on its merits, or was the support given it the product of complex forces that may have had no direct relation to the freedmen? This monograph is intended as a contribution toward answering this question so far as Kansas was concerned.

The study is based primarily upon Kansas newspapers, but utilizes the limited manuscript materials available. The subjects treated include the reactions of Kansas toward the negro population that flocked to the state during and immediately after the Civil War, the relations of Kansas to the traditional subjects of national reconstruction politics, and particularly the evaluation of the topics which Kansas thought were vital to its future development.

Little evidence was found to indicate the attitude of Kansas toward reconstruction of the south on its merits as policy. Certainly there was nothing to justify the traditional title "Radical Kansas." Prejudices toward the colored race and the devotion of the people to President Lincoln would refute that assumption.

Kansas was wholly absorbed in her own development. National issues were either supplanted by local and personal interests or were so confused with them as to be indistinguishable. Every election, save one, was fought out on local issues. Personal and local interests entered into the criticism leveled at President Johnson by the politicians, and had much to do with the tirade against Senator Edmund G. Ross for his vote on impeachment. It has been shown that Ross was not driven from the state because of his vote on impeachment.

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WESTERNERS AT HOME: COMMENTS OF
FRENCH AND BRITISH TRAVELERS ON
LIFE IN THE WEST, 1800-1840

(Publication No. 1557)*

Frederick Alexander Palmer, Ph.D.
University of Illinois, 1949

The West, in this thesis, consists of seven states — Kentucky, Ohio, Indiana, Illinois, Missouri, Michigan, and Wisconsin — that experienced approximately the same problems as they evolved from frontier regions into settled agricultural and commercial communities. This transformation was, generally, completed within the first four decades of the nineteenth century, although it began earlier in Kentucky and Ohio and ended long after 1840 in Michigan and Wisconsin. Instead of defining a frontier in terms of population a square mile, it has seemed more realistic to limit it by the kinds of people who lived there. Frontiersmen had peculiarities of conduct and outlook that separated them from more conventional Americans. Hence, when the residents who acted in accordance with these ideas left a region, the frontier disappeared with them. "Pure" frontiers seldom lasted long for there was an inevitable encroachment of men and ideas antithetical to the concepts that guided backwoodsmen.

A frontiersman possessed the "moving spirit." He often had moved a half dozen or more times during his life and felt that one of the principal advantages of a frontier was that there was nothing to keep him there. His log cabin was no more than a temporary dwelling, for he could not waste time or effort improving a residence that he would occupy briefly. Hunting was one of his major interests. He usually squatted on land instead of buying it and paid little attention to farming, which was a comparatively unimportant part of the self-sufficient hunting-farming economy by which he supported himself. As long as he lived on the fringe of a settled area he enjoyed independence of a sort. He felt few responsibilities, either to the primitive society or to his family. The agencies of law and organized government were far away and seldom penetrated the barrier of wretched transportation facilities. When the character of a region began to change as settled farmers or commercially

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minded citizens entered it, frontiersmen demonstrated their independence by leaving for some unsettled area where they could continue the life to which they were accustomed.

The dominant ideas of the society that developed as a region grew were far removed from the concepts of a frontier. Optimism and opportunism colored the thinking of members of the fundamentally commercial society that flourished in the settled West. Farmers began to produce for a market. Speculators and optimists founded towns, and urban standards of conduct, imported from the East or from Europe, were adopted by the new residents. This society was not a settled one, but individual members of it often intended to settle down to grow up with the country. It is difficult to discern any carryover of ideas from the frontier to this new social order.

Visitors and residents alike expected that Westerners would have or would develop traits sufficiently distinctive to warrant the use of the term "Western character." Travelers agreed on five traits — civility, the commercial spirit, curiosity, hospitality, and equality — that made up this supposed character. It is true that civility and the commercial spirit were common enough but they were not uniquely Western. The unusual curiosity and hospitality were products of frontier isolation; they lost their distinctiveness as population increased. Equality of a sort had been found on frontiers, where circumstances forced similar standards of living on all residents, but the chances for economic and social advancement in the settled West led men to preach but not to practice equality. There was no Western character. As the region matured it moved toward a similarity with the whole United States, not toward a distinctive sectionalism.

BISMARCK'S MEDITERRANEAN POLICY 1870-1890

(Publication No. 1542)*

Robert William Rhoads, Ph.D.
University of Pennsylvania, 1949

Bismarck's Mediterranean policies from 1870 until 1890 were concerned with the Mediterranean countries of Tunis, Morocco, Greece and Egypt. However, his Mediterranean diplomacy did involve most of the other European powers. He seemed to have had no long-range or prearranged Mediterranean policy, but he utilized that area as occasion arose to further his other designs elsewhere.

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As Fuller has declared, Bismarck never had an inelastic policy; he was always able to change it to meet the need of the time. Whenever he saw the need for a quid pro quo to further his European policies the chancellor often turned to the Mediterranean area.

The Franco-Prussian war of 1870 forced the German chancellor to orient his policy so that France would be isolated and made incapable of carrying on a war of revenge to retake Alsace-Lorraine. To forestall this danger, Bismarck encouraged French activity in Tunis. At the Congress of Berlin he persuaded Disraeli to offer France a free hand in that area and at the same time offered the French his blessings for colonial success in Tunis. French acquisition of the North African land of the bey did not, however, alleviate the revenge attitude nor did it bring France closer to Germany.

French ingratitude for his support in the Tunisian campaign and the threat of a Franco-Russian alliance brought a change in Bismarck's Mediterranean policy. He now began supporting the Mediterranean ambitions of the Italians and the British. The Triple Alliance of 1882 gave Italy a vague promise of support in that area, and the end of the dual control in Egypt brought forth German support of the British in Egypt. This encouragement of Great Britain in North Africa continued until 1884 and strengthened the bonds between Germany and England. In 1885 Germany embarked on several colonial ventures and thus came in direct conflict with the imperialism of the British. When Great Britain would not support German colonial ambitions, Bismarck withdrew his co-operation in Egypt and turned again to favor the aims of France in that area. Gladstone's defeat and the return of a Conservative government under Salisbury, coupled with the rise to power of the revenge leader Boulanger in France, brought an end to the Franco-German agreement on the Mediterranean and a return to closer co-operation between the British and the Germans.

This entente was climaxed in 1887 with the formation of the two Mediterranean agreements of February and December of that year. Through those accords, engineered and originated by Bismarck, England became a close associate of the Triple Alliance group. The Anglo-Italian agreement of February made it possible for the chancellor to conclude the renewal of the Triple Alliance in the same month of 1887 for Britain had assumed the obligations toward Italy in the Mediterranean that Austria had refused to accept. The renewal of the Triple Alliance and the conclusion of the Anglo-Italian Mediterranean agreements brought to an end the Bismarckian policy in the Mediterranean and its environs.

Therefore, we can see the over-all picture of the use of the Mediterranean in the policies of Bismarck. Other works either have presented only fragments of this story or have given it a superficial treatment based on incomplete sources. The motivations for

his shift of support from France to Italy become clearer. Finally we have convincing proof, contrary to Medlicott's most recent study of the Mediterranean agreements, that Bismarck was the initiator and the motivating force behind the two Anglo-Italian Mediterranean accords. The Mediterranean and its environs then played a significant, even though secondary, role in the policies of Otto von Bismarck.

LITERATURE

ETHICAL JUDGMENTS IN THE CRITICISM OF IRVING BABBITT, PAUL ELMER MORE, AND YVOR WINTERS

(Publication No. 1518)*

A. Keith F. McKean, Ph.D.
University of Michigan, 1950

This is an analytic and normative study of the theory and practice of the "ethical critic," as exemplified by Irving Babbitt, Paul Elmer More, and Mr. Yvor Winters. These writers may be described as ethical critics because they all agree, first, that literature should be judged by moral criteria and, second, that moral criteria supply the final test of literary excellence.

The first section of the study serves to clarify the problem with a general discussion of two basic issues: "What is the 'moral evaluation' of literature?," and, "Is it desirable?" The second chapter, a comparison of the attitudes of five pairs of European and American critics toward the moral evaluation of literature, is designed to fill in some of the major historical patterns up to the end of the nineteenth century. The next three chapters attempt to explain and evaluate the critical theory and practice of Babbitt, More, and Mr. Winters. A section is devoted to each, and the procedure in all three is to describe the critic's theory and then to examine his use of that scheme in his judgments.

Although the author is in complete sympathy with the aims of the ethical critic, the results of this study indicate that such a critic may be guilty of several serious faults:

1. He may be blind to the aesthetic qualities in a work and treat a poem, for example, as if it were a prose statement.
2. He may be so insensitive to the differences between the role of the moralist and that of the critic, that he leaves the work entirely to take up general moral questions.
3. He may fall into a mechanical dogmatism and thus undervalue all works which do not directly express his own attitudes.
4. He may approach all works with the same rigid moral standards.
5. He may be so inattentive to the possibility of the artist's implicit expression of moral attitudes that he either encourages overt didacticism or seizes upon the subject matter as the sole indication of moral worth.

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In general, Babbitt illustrates most of the worst faults of this critical mode. Acting as a moralist rather than a critic, he constantly moves away from art to deal with the far flung moral consequences of a belief. He makes only futile gestures toward uniting an ethical and an aesthetic concern with art, and in practice devotes little attention to the aesthetic. As a practicing critic he is, therefore, narrow, inflexible, and dogmatic.

More, who must rank far above Babbitt, does make a real effort to show that the morally good and the beautiful are essentially the same. He is, moreover, not blind to the aesthetic features. Both More and Babbitt, however, suffer from violent prejudices which considerably blunt their critical insight.

In contrast, Mr. Winters, who is by far the best of these critics, least exhibits the excesses the ethical critic may fall into. Mr. Winters' theory and practice have, moreover, considerably sharpened the technique of the ethical critic. His critical theory allows him to treat all aspects of a work with great precision, and he has shown himself, in practice, to be a flexible and sensitive critic.

LITERATURE, AMERICAN

JAMES KIRKE PAULDING, A STUDY IN LITERARY NATIONALISM

(Publication No. 1523)*

James Holman Robertson, Ph.D.
University of Michigan, 1950

James Kirke Paulding (1778-1860), a contemporary of Irving and Cooper, was a versatile American writer, who, in his own time, achieved high popular and critical acclaim in social and political satire, drama, biography, the short story, and especially in the novel. Paulding's writings, forgotten for almost a century, have, since the 1920's, received increasing attention from critics and historians of our literature. The resultant critical estimates of Paulding's significance, however, show wide diversity — a diversity which stems from two causes, viz., the multiform nature of Paulding's activities and interests, and the absence of any extensive study

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of Paulding's thought or of his literary theories and practices. The main purpose of this dissertation is to arrive at a critical estimate of Paulding as a man of letters — an estimate based, not on any single facet of his mind, but on the centrally significant factor in both his thought and his writings, his intense, pervasive nationalism.

The method of approach to this problem has been to establish the broad background of thinking on national literature from the Revolution to the Civil War, to examine the roots of Paulding's own thought out of which grew his own concept of national literature, to set forth the development of that concept, to show how his nationalism was implemented in his fiction, and finally, to consider the effect of that nationalism on his growth and development as a literary artist.

The conclusion reached is that Paulding's nationalism constituted, paradoxically, both his weakness and his strength. It was the principal cause of his failure as a literary artist, because Paulding, except on rare occasions, never learned to subordinate it to the demands of his story. On the other hand, this absorbing interest in nationalism bestows on Paulding a high historical value. Because of it, Paulding was led to examine the contemporary American scene, to recognize and affirm the virtues of a democratic society which acknowledged the supreme importance of the individual, and to preach the necessity for a courageous self-reliance. Paulding, in short, is one of the pioneers in our literature who helped prepare the ground for Emerson and Whitman.

LITERATURE, ENGLISH

AN EDITION OF RICHARD EDWARDES' DAMON AND PITHIAS (1571 PRINTING)

(Publication No. 1553)*

James Louis Jackson, Ph.D.
University of Illinois, 1949

This study is an attempt to analyze the construction and sources of an early English Renaissance play, the Damon and Pithias as printed in 1571. To establish the text, the three known copies of the

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1571 edition were collated. The copies in the Folger and Huntington Libraries on microfilm were compared with the British Museum copy in the Tudor Facsimile Texts. One section of variant readings in gathering "F" showed changes made while the play was in press. To the text thus established, Notes and Glossary have been added, the Notes giving sources for most of the play's Latin lines.

The Introduction is made up of chapters on History of the Play, Plot, Characters, Concepts, Style and Rhetoric, and Estimate of the Play. Under History of the Play, information is collected on the dramatist's life, the place and date of the play's presentation (Whitehall, 1564), the printings, and the staging, music, and verse. Under Plot, the source of the play is shown to be a well-known apophthegm found in Cicero, Valerius Maximus, Erasmus, and Textor, as well as in Elyot's Governor and many other places. The usual source given for the play, the Governor, provides some but not all of the play's details; most of them come from the classical versions. The dramatic structure of the play reveals that the playwright used the five-act act formula as far as the outlines of the plot permitted. Edwardes seems to have added the contrasting subplot. The play is also discussed as tragi-comedy, since it is an averted tragedy, presents two plots with different outcomes, and uses both high and low personages.

Of the six upper class characters, four are historical Greeks (Aristippus, Dionysius, Damon, and Pythias) and two, Eubulus and Carisophus, are idea-personages with Greek names. The six lower characters draw some of their traits from the comic Latin servant. The concepts of the play are those of friendship, kingship, and courtiership. The friendship ideas are often cast in sententiae and are almost invariably from the classical tradition. Two passages paraphrase Cicero's Of Friendship. The kingship ideas are also traditional classical ones seen mainly in the condemnation of tyrants. In the ideas of kingship and courtiership there is not much contemporary influence; the good courtier is simply the good man.

The chapter on Style and Rhetoric discusses first a scene taken from Plautus, about twenty-five lines in Damon from Senecan sources, and two passages from Cicero's Of Friendship and one from his Offices; and rhetorical forms are discussed: a praise of a city, a theme in oration outline, contraries, imago, subiectio, and urbanitas. Sententiae are the figure which dominates the play, and they are reenforced by many native proverbs, though throughout the play classical traditions far overshadow native ones. Finally, the concluding section of the chapter draws together the sources given in the Notes and the forms discussed in this chapter, and these details together strongly suggest the pattern of the sixteenth century grammar school curriculum.

The last chapter of the Introduction, estimate of the Play, first surveys the judgments on Damon by scholars. Then the conclusion of this study is drawn: that the plot, dramatic structure, characters, concepts, and rhetoric of the play all strongly suggest the English grammar school curriculum. The main conclusion is that Damon and Pithias is made largely of grammar school materials and is best classified as a school play.

ELEMENTS OF SENTIMENTALISM IN ENGLISH

TRAGEDY, 1680-1704

(Publication No. 1554)*

Lewis Malcolm Magill, Jr., Ph.D.
University of Illinois, 1949

The purpose of this study is to examine representative tragedies written and produced in England between 1680 and 1704 to discover, if possible, elements of sentimentalism which, when full-grown, give us the sentimental, middle-class tragedy of the eighteenth century.

The term sentimental is difficult to define, particularly as it refers to the tragedy. One problem is that the name of the eighteenth-century sentimental tragedy is domestic tragedy, domestic being used as a synonym for middle-class. Consequently, it has been all too common for historians to consider that because the eighteenth-century tragedy is bourgeois, it is per se sentimental.

Furthermore, since Shaftesbury and the Deists are usually credited with disseminating sensibility, there has been a tendency in some quarters to lean heavily on an optimistic view of human nature as the chief criterion for sentimentalism in tragedy.

In the study we have admitted the partial validity of these conventional criteria and have traced them through the tragedy of our period; but we have added two additional tests for sentimentalism in tragedy. The first, closely related to an optimistic view of human nature, is the sentimentalists' belief that tragedy should cause a sense of pity in an audience. This belief, of necessity, minimizes the element of terror as an emotional catharsis and leads to a succession of pitiable characters on the stage, many of whom are simply excrescences on the action. We have chosen to call this tendency among critics and playwrights the Cult of Sympathy, and we have traced it in the tragedies of the period.

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Our second test for sentimentalism in tragedy is didacticism. Probably originating as a canon of neo-Aristotelianism, the desire to point an obvious moral became habitual with the eighteenth-century sentimentalists. We have traced didacticism in the curtain speeches of our period. In addition, there grew up among the late-seventeenth-century critics a demand for the meting out of strict poetic justice. Since this poetic justice is a system of rewarding virtue and punishing villainy, the playwrights who had respect for the opinions of the critics were faced with the dilemma either of sacrificing pity for their protagonists in order to allow them to meet catastrophe or of letting poetic justice go by the board. Eventually they worked out a compromise: They emphasize that the frailties of their protagonists are extenuated by good intentions. Thus, they were able to satisfy the demands of poetic justice as well as their own desires to arouse pity in the audiences.

We have concluded from the study that there is no easy method of defining sentimentalism in tragedy. The four criteria which we have applied to the tragedies of our period are suggestive rather than definitive. Admittedly, the core of sentimentalism is probably more nearly a state of mind than anything else.

However, we have established that all four of the criteria may be found in the tragedy of our period, with the exception of narrow domesticity. The cult of sympathy is in full swing from 1694 onward, and, indeed, may be found as an important element in Otway's tragedies as early as 1680. Didacticism may be found throughout the period, gradually dwindling from morals which apply to heroic events to those which have reference merely to narrowly family situations. We find comparatively innocent protagonists in the tragedies of Otway and Banks early in the period and a plethora of them during the last decade. Although we discover no truly bourgeois protagonists before 1704, we can trace a gradual lowering of the social scale and a narrowing of the scope of conflict in the tragedies.

RICHARD HOLT HUTTON: A BIOGRAPHICAL
AND CRITICAL STUDY

(Publication No. 1561)*

Glyn Nicholas Thomas, Ph.D.
University of Illinois, 1949

Richard Holt Hutton (1826-1897), editor of the Spectator and a

* Microfilm copy of complete manuscript of 406 pages, \$5.08.
Enlargements 6" x 8", 10¢ per page. Library of Congress
Card Number Mic A 50-43

key representative of the most intellectual defenders of Victorian liberal orthodoxy, was generally considered at the head of English journalistic genius. From 1861 to 1897, he was the Spectator, tracing for his readers the intricacies of the Victorian intellectual mosaic. Thus the study of Hutton is, in effect, the study of the Spectator's editorial policy. As a man distinctly independent in thought yet representing the eclectic fusion of many significant nineteenth-century formative forces, he serves the modern student in appreciable measure as an index to the confusing undercurrents of Victorian thought. I have attempted to show in this study the basic integration of R. H. Hutton's thought, to indicate those influences at mid-century which stimulated his development, and to demonstrate the nature of those principles to which he adhered. The biographical detail, derived from published and unpublished materials, is important in that it points up Hutton's intellectual and professional development.

The study is divided into three main parts. In the first part I have traced Hutton's life from his birth in 1826 to his death in 1897. His education is given in detail because Hutton represents that considerable class which was denied entrance to the public schools and to the great universities. His friendships and controversies; his activities in such representative Victorian circles as the Metaphysical Society and the Society for Psychical Research; his professional, social, and private life as editor of the Inquirer, National Review, Economist, and Spectator — all are included in this attempt to present a composite of those formative influences and events which in some way contributed to his natural development. The second part presents in some detail the lines of Hutton's development as a religious thinker, touching upon the several aspects involved: The nature of his own particular Unitarian background; the influence of such men as Walter Bagehot, James Martineau, F. D. Maurice, John Henry Newman, and F. W. Robertson; the psychological and dogmatic bases of Hutton's acceptance of a liberal orthodoxy; the nature of his position relative to key Christian doctrines; and, finally, the dilemma created by the clash between his conviction of the validity of the protestant spirit of free inquiry and his yearning for a greater religious certainty than that conviction enabled him to feel. The final part indicates the basic integration of Hutton's religious, socio-political, and literary principles — particularly as they are revealed in his published essays and in the editorial policies of the Spectator.

The final picture projected is in some measure an indication of Hutton's intrinsic significance and of the manner in which the main currents of nineteenth-century religious, philosophical, and literary thought, particularly that stream which had its immediate source in the writings of Coleridge, affected the development of an influential

Victorian who exhibits both the strength and weakness of his age. A Broad Church man in a specific sense, Hutton had not that hazy and invertebrate good-nature which reduces principles to an indeterminate hodge-podge. He fought, sometimes narrowly but generally effectively, for the tenets of theism. His theory of human development, which combines a Burkean conservatism with a liberal willingness to discard the traditional in the light of man's growing knowledge, is as characteristic of his political as of his religious thought. And controlling his explications and formal criticisms of literature is the same core of religious convictions. All pervasive in his writings is his basic theory of unity — that unity based upon the conception of a primary mind in the universe.

M A T H E M A T I C S

STUDIES OF ONE PARAMETER SUBGROUPS
OF CERTAIN TOPOLOGICAL AND MATRIX GROUPS

(Publication No. 1506)*

Marjorie Lee Browne, Ph. D.
University of Michigan, 1950

The question of existence of a one parameter subgroup containing a given element plays an important part in the theory of topological groups. This question is usually handled by methods involving extraneous elements, for instance functions defined on the group. The present paper deals with an intrinsic method which uses only the topology of the group and the group operations. The general scheme consists in obtaining the one parameter subgroup containing a given element as a limit of certain chains of left translates of neighborhoods of the identity. These chains connect the identity of the group to the given element. Two types of such chains are considered.

Certain conditions must be satisfied by the finite neighborhood of the identity in which the method leads to desired results. A large part of the paper is devoted to the establishment of such conditions and to the discussion of groups in which these conditions are satisfied. Especially, groups of matrices are studied from this point of view; in this study it becomes necessary to introduce two types of norms of matrices and certain canonical forms different from the usual ones. With the aid of these concepts it is possible to determine a neighborhood of the identity in the full linear group of order n in the complex field which has some of the desired properties and to solve the question completely for the unitary group.

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ALGEBRAS WITH RADICAL: AN INVESTIGATION
OF THE CLASS QF 1-3

(Publication No. 1508)*

Felice H. Davidson, Ph.D.
University of Michigan, 1950

The purpose of this paper is to continue the investigation of algebras with radical. In a recent paper [Transactions of the American Mathematical Society Vol. 64 (1948) pp. 173-183] R. M. Thrall has considered three classes of algebra with radical. Algebras of the third class which are also of the first class are considered here. The first class, the class QF-1, is the class of algebras which have as the set of second endomorphisms of every faithful representation space only the algebra itself. The third class, the class QF-3, is the class of algebras which have a unique minimal faithful representation space. The investigation is restricted to algebras which have an algebraically closed coefficient field and which have only one-dimensional irreducible subspaces. The first of these restrictions really narrows the class of algebras to which the results apply. The second restriction is only an apparent one, inasmuch as in order to decide whether a given QF-3 algebra is QF-1, it is sufficient to consider a related algebra with one-dimensional irreducible subspaces.

The concept of duality plays an important role in the proofs. In particular, for algebras which are QF-3 and for which $N^3 = 0$, where N is the radical, there is a certain dual pairing of subspaces of N/N^2 to the coefficient field of the algebra which yields a more positive method of attacking this case.

The paper contains general results about endomorphisms of representation spaces for algebras. The main theorem applies to algebras for which the cube of the radical is zero. For these algebras, necessary and sufficient conditions are given that a QF-3 algebra be QF-1. These may be stated in terms of the Cartan invariants of the algebra.

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THE SPACE OF BOUNDED MAPS INTO A BANACH SPACE

(Publication No. 1516)*

Meyer Jerison, Ph.D.
University of Michigan, 1950

Let B^X be the Banach space of continuous maps from a compact topological space X into a real Banach space B . This paper is concerned with the extension to more general spaces of certain properties of B^X that are known to hold when B is the space of real numbers.

An example shows that it is not true, in general, that if B^X and B^Y are equivalent Banach spaces then X is homeomorphic to Y . This theorem is proved, however, for a space B with the property that if two maximal convex subsets of the surface of the unit sphere intersect, there is a third one that meets neither of them. For such a Banach space B , a homeomorphic image of X can be constructed from certain collections of maximal convex subsets of the surface of the unit sphere of B^X , and this leads to a proof of the theorem.

Strictly convex Banach spaces are among the spaces that satisfy the condition on B given above. A characterization of the space B^X is given in this case. The characterization is related to those of Myers (Annals of Mathematics, vol. 49 (1948)) and Arens and Kelley (Transactions of the American Mathematical Society, vol. 62 (1947)) for the space of real valued functions on X .

When B is strictly convex, the relation between an equivalence of spaces of mappings and a homeomorphism of the topological spaces is given explicitly. If T is the equivalence of B^Y onto B^X , then there exist a homeomorphism h of X onto Y , and an equivalence φ_x of B onto itself for each point x in X , such that $(T\beta)(x) = \varphi_x[\beta(h(x))]$ for all β in B^Y . The mapping of X into the space of rotations of B determined by φ_x is continuous if the point-open topology is used in the image space.

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GENERALIZED FOURIER EXPANSIONS

(Publication No. 1524)*

Ward C. Sangren, Ph.D.
University of Michigan, 1950

The solution of boundary value problems involving interfaces or surfaces of separation of two media calls for expansions which generalize the ordinary Sturm-Liouville or Fourier expansions. The purpose of this paper is to obtain some of these generalized expansions and to determine under what conditions an arbitrary function $f(x)$ can be expressed in terms of the expansions considered.

In order to obtain these expansions, four two-dimensional problems in the distribution of steady-state temperatures are considered. The first problem considered deals with the temperature distribution in a semi-infinite thin plate consisting of two layers of finite width and of different materials. In the second problem this is generalized to include radiation. In the third problem one of the layers is semi-infinite in width. The final problem deals with two layers of semi-infinite width.

After introducing corresponding problems in transient temperatures, a method involving the use of the Laplace transform is used to derive the expansions needed in the steady-state problems. The Laplace transform method gives not only the formal expansions but also a method of verifying the expansions.

The expansions are also obtained formally by the classical method of separating variables. In this method a step function is used for a weight function.

Although these expansions are considered in connection with temperature problems, they also arise in problems in diffusion theory, potential theory and vibration theory. The results of this paper are then a step towards putting the theory of boundary value problems with interface conditions on the same level as those with continuous media. In an almost equivalent sense, this paper treats Sturm-Liouville systems where the coefficients are discontinuous in the same manner in which ordinary Sturm-Liouville systems have been treated.

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MUSIC

THEORETICAL INTRODUCTIONS IN AMERICAN TUNE-BOOKS TO 1800

(Publication No. 1505)*

Allen Perdue Britton, Ph.D.
University of Michigan, 1950

The primary task of this study has been to explore and analyze the content of the theoretical introduction to the American tune-book of the eighteenth century. Two distinct but self-complementary methods have been followed in presenting the results of the investigation. One is represented by the eight chapters which form the main body of the work and the other by the annotated bibliography of tune-books which follows.

The eight chapters constitute a general approach to the subject, beginning with an analysis of the historical background — with particular reference to the origin and musical implications of Protestant psalmody, the advent of vocal music instruction in the American colonies, and the general output of tune-books here during the eighteenth century — and continuing with a presentation and evaluation of the actual materials, methods, and principles of instruction utilized. The bibliography of tune-books is specific, presenting an analysis of the content of all individual works of which it has been possible to find a copy.

The basic method of teaching employed was based upon the use of the four-syllable fasola solmization. Pupils were expected to learn the order of these syllables together with the necessary rudiments of music before actually beginning to sing. Psychologically, this approach was atomistic, but its worst features were probably compensated for by the clear-cut aim of the instruction (to learn to read music) as well as the social attractions of the singing school sessions themselves. Although the materials and methods of instruction seem to have remained the same throughout the century, there is no lack of evidence that a few teachers, at least, creatively attempted new methods of various kinds.

The bibliography of tune-books gives the full title (with conventional indications of typographical attributes), pagination, dimensions, content, number of editions, and locations of every work containing religious music published in the United States before 1801. Works published after 1800 by compilers who began publishing

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before that date are also included. Thus, the bibliography complements the Sonneck-Upton Bibliography of Early Secular American Music.

In addition, there are an annotated bibliography of eighteenth century sermons and pamphlets relating to music and a bibliography of articles and books. Supplementing these are a selected bibliography of English tune-books and other foreign works relating to the topic and a bibliography of secondary source materials.

PHILOSOPHY

INSTITUTIONAL THEORIES OF LAW: HAURIOU AND JORDAN

(Publication No. 1547)*

Thomas Morris Haynes, Ph.D.
University of Illinois, 1949

This dissertation, which is a study in the philosophy of law, presents, compares and evaluates two institutional theories of law developed independently by the French jurist Maurice Hauriou (1856-1929) and by the American philosopher E. Jordan (1875-). The exposition of Hauriou's theory is based upon a study of several of his articles, especially "La théorie de l'institution et de la fondation," and upon relevant chapters and passages from various editions of his major works: Précis de droit administratif; Précis de droit constitutionnel; Principes de droit public. The presentation of Jordan's theory takes the form of a systematic account of the doctrine found in his Forms of Individuality and Theory of Legislation.

The two institutional theories assume that the primary juridical reality is not the individual human person, is not a fact to be found by purely descriptive science, and is not an abstract norm to be grasped by intuition and elaborated by deductive logic. The central juridical reality is rather the institution, taken to be a normative fact, a social fact which is the seat of the most fundamental type of law. In Hauriou's theory the institution is a synthesis of an idea of a social enterprise to be realized and a power or authority to govern that enterprise; in its highest form, the institution involves a widespread communion in the idea of the enterprise. Hauriou seeks to justify the institution and to explain its existence and stability partly through attributing to ideas a "recruiting" power and partly through a principle of more or less automatic separation and equilibration of powers, considered as guaranteeing the ascendancy of the idea over mere power.

Jordan's theory of institution is based squarely upon his own reworking of the doctrine of philosophical idealism, and this provides him a basis for a continuity in principle of idea, will and property. It has been concluded that this has enabled him to show an inherent connection between the law of property, the law of

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persons, and the fundamental "ideas" or cultural functions. Jordan's understanding of law results also in the theory of law including as an integral part of itself a theory of legislation, the legislative process involving a speculative determination of ends inherent in the social structure, and an experimental administrative process of attempting to realize those ends. It has appeared that Jordan's theory rescues philosophical idealism from its usual connection with political conservatism, and does so in a manner which precludes anything like political totalitarianism.

Mention has been made of several major problems in juridical theory to which the institutional seems to provide an answer. The principal issues discussed are the breakdown of the attempts to find a "province" for law separate from the entire range of social issues, and the recent growth of public law at the expense of so-called private law, as manifest in the expansion of administrative law, for which there has been heretofore no philosophical justification.

PHYSICAL EDUCATION

THE RELATIONSHIP BETWEEN BILATERAL CONTOUR ASYMMETRY IN STANDING AND WALKING

(Publication No. 1490)*

Laura J. Huelster, Ph.D.
New York University, 1949

The Problem

The purpose of this study is to determine the difference between the left and right lateral contour of the body during the walk when weight is supported alternately on each limb, and the relationship of that difference to the bilateral contour of the body in stance.

Procedure

Posterior view motion pictures of standing and walking were taken at the University of Illinois of a sample of 150 nude freshmen college women with no physical limitations. Three enlarged photographs were made of each subject while standing, and while walking with weight supported on the left limb and on the right limb. A central vertical axis and 26 corresponding measurements of bilateral contour asymmetry were determined on two sets of three photographs each of 30 experimental subjects. Twenty of these asymmetries were retained for use in this study. The data were obtained from these asymmetries.

Statistical methods were zero-order and biserial correlations, mean scores, factor analyses, and score-form regression equations.

Results

Significant results are:

1. The reliability of the 20 corresponding asymmetries in standing and walking indicates that bilateral contour asymmetry tends to be highly consistent in the pelvis, especially at the top of the sacrum, and to decrease above and below this level. In general, contour asymmetry tends to be more consistent in walking, particularly in left limb support, than in standing.

2. The general pattern of asymmetry in standing tends to occur to the right of the axis, with the left limb closer to the axis. During the walk, the supporting limb moves closer to the axis; the asymmetry of the pelvis tends to increase to the right in right limb support and decrease in left limb support; while above the pelvis, asymmetry tends to increase to the right in

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left limb support and to increase slightly to the left in right limb support.

3. Three corresponding patterns (clusters of asymmetries in a factor analysis) occur in standing and walking:

Pattern I. Lateral contour of the body from the head through the third lumbar vertebra tends to deviate to the same side of the axis. This pattern is best predicted at the level of the twelfth thoracic vertebra. The factor is lateral bending in the coronal plane occurring primarily in the intervertebral joints.

Pattern II. Lateral contour of the body from the crests of the ilia through the distal thighs tends to deviate to the same side of the axis. This is the most reliable and stable pattern. It is best predicted at the level of the thigh joints. The factor is rotation in a coronal plane primarily at the thigh joints.

Pattern III. In standing, difference in angulation of the feet, and in walking, angulation of the swinging foot, tends to be associated with difference in the height of the distal thighs. The factor is a synthesis of rotary movement in all the cardinal planes at the thigh joints.

4. In walking, no matter which limb supports the body, Patterns I and II tend to deviate to the same side of the axis as in standing. However, the degree of asymmetry during the walk is more significantly related to the degree occurring in standing when the body moves laterally in response to support on the limb (left) which is closer to the axis in standing.

5. Relationships between asymmetry and age, height, weight, handedness, and foot preference were determined.

Implications

Neuromuscular habit patterns, occurring with bilateral contour asymmetry of the body in stance, tend to persist and to influence the rhythm of lateral sway associated with the walk.

Educational implications are drawn for taking posture pictures to make them useful and measurable, and for teaching posture and physical education activities.

A VALIDATION OF CARDIOVASCULAR TESTS BY
CARDIAC OUTPUT MEASUREMENTS

(Publication No. 1552)*

Paul Alfred Hunsicker, Ph.D.
University of Illinois, 1949

Introductory Statement

In the past half century a whole host of tests have been devised in physical education which supposedly measure cardiovascular condition. In an attempt to cast additional light on the interpretation of these tests, it was decided to correlate some cardiovascular test results with cardiac output determinations.

Methodology

The following tests were administered to 41 college students:

1. The Heartometer Test
2. The Schneider Test
3. The 5-Minute Harvard Step Test (17" step)
4. The Simplified Tuttle's Pulse Ratio
5. The Flarimeter Breath Holding Test
6. The Flarimeter Breath Holding Test after 1' of stepping on a 17" bench at 30 steps per minute.
7. The Tigerstedt Index
8. The Stone Index
9. The Barach Index
10. The Erlanger-Hooker Index
11. The Gale Formula (as revised by Cameron)
12. The Cureton Cardiovascular Condition Factor
13. The Electrocardiogram
14. The Cardiac Output Determination at the end of a 4' jog on a treadmill set at an 8.6 per cent grade and running five miles per hour
15. The Cardiac Output Determination at the end of an all-out run on a treadmill set at an 8.6 per cent grade and running ten miles per hour

The acetylene rebreathing method was used for both cardiac output determinations. Ten men were re-tested on the 4' jog and

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these output measurements were used as a check on the reliability of the acetylene method. It should be pointed out that a good deal of practice in use of the acetylene method is a prime prerequisite of this technique. The standard error of the difference between means on the first and second trials was calculated and found to be ± 1.90 liters per minute. This represents a 9 per cent error around the mean.

The various cardiovascular tests were correlated with minute volume/surface area and stroke volume/surface area for both runs as well as with the all-out run time. The 5 per cent level of significance was arbitrarily adopted as the criterion of minimal acceptable statistical validity.

Summary

The following tests could be termed valid to some degree of association based on the findings in this study, as indices of the heart output during treadmill all-out running at ten miles per hour on an 8.6 per cent grade:

	r	\pm	S.E.
1. The Schneider Test	.39		.16
2. The Simplified Tuttle's Pulse Ratio Test	- .32		.14
3. The Barach Index	- .50		.14
4. The Erlanger-Hooker Index	- .40		.16
5. The Breath Holding Before Exercise Test	.47		.15

None of the tests could be used to indicate cardiac output during the 4-minute jog at 5 miles per hour on an 8.6 per cent grade. This is evidently too mild an exercise and in most cases there is too little circulatory stress to bring out the relationships.

The all-out run time correlated significantly with the all-out stroke volume, $.49 \pm .15$. However, there is obviously more to being able to run the treadmill a long time than a pure circulatory factor. The great majority of subjects complained of fatigue in the legs as being the limiting factor in their time on the treadmill.

The stroke volumes for the all-out run ranged from 89 cc. to 224 cc. ($M = 148$ cc.; $S.D. = 33$ cc.). The latter is about as high as has been reported and was obtained on a well-trained man.

Since various studies, some of the factor analysis type, show there are several relatively independent factors in cardiovascular condition, some of the tests may be valid when tested against suitable criteria other than acetylene blood flow.

AN ANALYSIS OF DIFFICULTIES ENCOUNTERED BY
BEGINNING ELEMENTARY SCHOOL TEACHERS OF
PHYSICAL EDUCATION IN SIX MID-WESTERN STATES
AS A BASIS FOR REDIRECTION IN TEACHER EDUCATION

(Publication No. 1491)*

Delia P. Hussey, Ed. D.
New York University, 1949

The study is an analysis of the major difficulties encountered by beginning women teachers of physical education in elementary schools. The difficulties which relate to important goals and values have been used as a basis for proposing redirection in teacher education in the nationally accredited universities and colleges of six mid-western states.

The present study was undertaken in response to numerous requests from teachers and because of the writer's experience with beginning teachers in supervision, demonstrations, and discussions. The study is significant in that it uses the opinions of teachers in areas which are of vital concern to them, and these opinions are considered in establishing a basis for redirection. The need for such a study is substantiated by the evidence which reveals that many teachers experience great difficulty in achieving desirable goals and values for children at the age when physical education is most important.

Goals and values were established for physical education in elementary schools as the first step in the progress of the study. These were sent to ten authorities for comments and criticisms. The suggestions were incorporated and final approval was received from each of the authorities.

A questionnaire was used to discover the difficulties which confront beginning teachers and the factors which influence the effectiveness of teaching in various situations. The areas in which the teachers received inadequate preparation and their recommendations for improvement in the undergraduate curricula were discovered through the questionnaire. Dance composition, which involved the creative approach, and health instruction were the areas in which the highest percentage of teachers reported inadequate preparation and also the ones considered most difficult to present. Dissatisfaction was expressed with problems related to school

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administration and supervision, community attitudes, human relations, and citizenship qualities. The most difficult factors reported in the teaching situations were the lack of free time, the size and number of classes, subjects taught in unfamiliar fields, and extra-curricular responsibilities. The recommendations most frequently expressed by the teachers related to extending practice teaching experiences and to the area of child study. The fact that 46.41% of the teachers were only fairly satisfied with teaching in the elementary schools and 9.27% were dissatisfied is significant for this study.

The present practices in the institutions were investigated by means of interviews and questionnaires. The practices that were included for consideration in the questionnaires related to the problems that were encountered by the teachers. The resulting data were analyzed with regard to teaching difficulties and the factors which influenced teaching effectiveness. Practice teaching in elementary schools was not required in 23.53% of the institutions and 17.64% permitted a choice between elementary and secondary schools. Of the teachers questioned, 16.49% did not have practice teaching experience in elementary schools. There was no emphasis placed on human relations, contemporary issues, or community participation in some of the institutions. Applications to the elementary age group were not made in dance composition, physiology, or health instruction, even though many teachers expressed difficulties in these areas. Experiences in the use of audio-visual aids, makeshift equipment, and the use of accompaniment for dance were not provided in some of the institutions. Approximately one-half of the institutions did not attempt to observe students after placement or to schedule conferences with their graduates.

Proposals for redirection in teacher education were advanced in the areas of practice teaching, general and professional education, health and physical education, school and community participation, and in meeting and promoting change. The chapter on the proposals is a recapitulation of the data received in previous chapters. Therefore, it serves as a summary for the completed study, and includes implications for the future in preparing teachers of physical education for elementary schools.

AN INVESTIGATION OF BREATH-HOLDING AS A MEASURE OF CARDIOVASCULAR FITNESS

(Publication No. 1555)*

Henry Joseph Montoye, Ph.D.
University of Illinois, 1949

Statement of the Problem

The principal problem of this study was to investigate the relationships between maximum breath-holding time and various performance and non-performance measures of cardiovascular fitness in normal, healthy young men.

Subordinate problems of the study were the investigations of the relationships between breath-holding and:

- a. Rate of capillary O₂ depletion during breath-holding
- b. Breath-holding using the first sign of contraction of the abdominal muscles as the end-point
- c. Ratio of the maximum breath-holding time before exercise to the maximum breath-holding time after exercise

Review of the Literature

An analysis of previous studies revealed no adequate evidence that breath-holding ability is related to cardiovascular fitness in healthy subjects. However, breath-holding has been used very extensively as a clinical test of disease, especially heart disease, and also as a test of physical fitness.

Methods of Procedure

The breath-holding tests were given before and immediately after a standard 17" stool-stepping exercise of 60 seconds at 30 steps/min. The breath was held on the flarimeter against a pressure of 20 mm. Hg with both orifices closed. In almost all cases the tests were repeated a second time.

In the correlation work, from 17 to 54 cases were used to derive coefficients of correlation between the breath-holding tests and the measures of cardiovascular fitness. Oxygen deletion rate was measured with a Coleman anoxia photometer. The Grollman acetylene method was employed to determine cardiac output. Alkali reserve consisted of the CO₂ combining power of the blood plasma as measured on the Van Slyke apparatus.

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Hemoglobin was determined with a Cenco-Sheard-Sanford Photometer.

In the vitamin E experiment fifty subjects (college men) were divided into two groups. The one group comprised students enrolled in a beginning swimming course; the other group was composed of members of the same fraternity. Each of these principal groups was in turn divided into three sub-groups. Sub-groups "A" received 300 milligrams of alpha-tocopherol acetate during a two week period. Sub-groups "B" received 288 wheat germ oil capsules per week containing 150 milligrams of vitamin E. Sub-groups "C" were given placebos identical in number and appearance to the wheat germ capsules. The feedings continued for nine and one-half weeks in the swimming group, and twelve weeks in the fraternity group. Breath-holding tests were administered before and at the end of the feeding period.

Results

The breath-holding tests before exercise gave consistently higher zero order coefficients than the breath-holding tests after exercise. Among the most significant of the coefficients of correlation obtained were the following:

Breath-holding before exercise with:

- a. O₂ intake per minute (all-out run), 0.444 (N = 36)
- b. Stroke volume/surface area (all-out run), 0.485 (N = 28)
- c. Per cent hemoglobin, 0.546 (N = 17)

O₂ depletion time during breath-holding before exercise with:

- a. Minute volume/surface area (all-out run), 0.467 (N = 30)
- b. Stroke volume/surface area (all-out run), 0.385 (N = 22)

Contraction time during breath-holding before exercise with:

- a. O₂ intake per minute/surface area (all-out run), 0.592 (N = 28)
- b. Minute volume/surface area (all-out run), 0.436 (N = 28)

Partialling out the influence of the run time did not appreciably lower the cardiac output - breath-holding coefficients. However, when the common variance due to O₂ intake or cardiac output was partialled out, the coefficients between the breath-holding test scores and the run times approached zero.

THE CONSTRUCTION OF ACHIEVEMENT SCALES FOR THE
MEASUREMENT OF PERFORMANCE IN SELECTED
PHYSICAL EDUCATION ACTIVITY SKILLS

(Publication No. 1499)*

Raymond A. Weiss, Ph.D.
New York University, 1949

This investigation was undertaken to develop measurement devices and construct achievement scales for use in evaluating performance in twenty-five skills of football, soccer, and softball in the public schools of the State of New York at the secondary level for boys.

The importance of this study stems from the need for better direction in the teaching of physical education. The use of achievement scales should enable the instructor to teach to a level at which the greatest number of students would receive the most good.

As a first step, devices to measure skills performance were developed for the twenty-five skills included in this study. Each device was constructed in such a way as to approximate, as nearly as possible, the most desirable method of practicing the skill. In the process of preparing the devices, they were subjected to field trials for the purpose of improving their effectiveness from the point of view of ease of administration, variability of score, range of difficulty of scores, and standardization of test instructions.

Utilizing these measurement devices, 18,076 scores were obtained from boys in grades seven through twelve in twenty-seven representative secondary schools in New York State. Sampling representativeness was based upon six factors: Type of school, school enrollment, program rating, community population, regional representativeness and grade level. In addition to recording test scores, data on age, height, weight, grade level, and physiological maturity also were collected. The reliabilities for the twenty-five skills were found to range from .32 to .97. On the basis of a reliability standard of .70, six soccer events having substandard reliability were dropped from the study.

For those events which were measured in accuracy units, simplified pass-fail scoring methods were compared with more complex scoring, which was devised originally, in order to determine whether the simpler methods could be substituted.

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In every case, it was found that the substitution could be made.

The scores in the nineteen performance events and the records for the five growth factors were utilized in connection with the development of a classification plan. Correlations between performance and each factor, and between performance and combinations of factors were computed and the results were interpreted in the light of practicability as well as statistical evidence. In accordance with the findings, a single factor, grade level, was selected as the basis for classification of students in the preparation of achievement scales.

The scores for each measurement device except one were grouped into distributions according to grade level, and achievement scales were constructed wherein each distribution was converted to a standard scoring scale ranging from zero to one-hundred. The correlation of performance in the soccer corner kick with grade level was found to be insignificant and, accordingly, for this event, a single scale was prepared utilizing combined data from all grade levels. All achievement scales were prepared using smoothed values which were derived from the data on the basis that theoretically performance in physical education activities show a smoothly increasing function with growth. The data were found to display regular patterns of changing performance with changes in grade level, which is evidence in support of the above hypothesis.

On the basis of the evidence presented in this study, the following conclusions were set forth:

1. Armchair methods of devising measurement devices for skills performance represent only a starting point in the process, and the major portion of the work must be accomplished under laboratory conditions.
2. Measurement devices, having acceptable reliability, variability, and range of difficulty, can be developed for which use in the class instructional program constitutes an acceptable practice situation as well as a test.
3. Measuring procedures which involve the use of three or more scoring subdivisions can be modified by the substitution of simplified pass-fail scoring, with little loss of accuracy.
4. The growth factors of age, height, weight, grade, and maturity all are related in varying degrees to performance in the skills of football, soccer, and softball.
5. The use of grade level as a basis for preparing achievement scales in the skills of football, soccer, and football, is as effective as would be the use of any other single factor or combination of factors among those studied in this investigation.

RESULTANT CHANGES OF CERTAIN BLOOD CONSTITUENTS FOLLOWING EXERCISE

(Publication No. 1537)*

Bernard Wolcyn, Ph. D.
New York University, 1949

Purpose

The general purpose of this research was to determine the quantitative changes that occurred in the erythrocyte number, hemoglobin content and hematocrit volume of blood as a result of a limited period of exhaustive exercise in individuals who were in different stages of physical condition.

Limitation of Problem

This research was limited to a study of healthy male students from New York University between the ages of seventeen and twenty-seven inclusive. These subjects represented three levels of training. The well-conditioned group consisted of athletes from various sports, the average group was made up of physical education students and the sedentary group was composed of minimum activity participants. These three groups, known as the selected groups, were chosen to obtain a representative sampling of physical condition in college students. The divided groups, Superior, Average and Poor, used in this study were obtained by relocating and dividing the subjects of the selected groups into three numerically equal groupings based on order ranking of performance scores.

This investigation was confined to analyses of erythrocyte number, hemoglobin content and hematocrit volume on capillary blood by means of standard micro-techniques.

Experimental Procedure

The step-up exercise served two purposes in this study: (1) It effected an exhaustive physiological state to create hematological differences. (2) It provided a measure of work on which to derive an objective score, known as the Physical Performance Index.

The exercise consisted of three minutes of all out step-up work on a platform with an adjusted touch device to insure complete transfer of the body's center of gravity.

Under controlled laboratory conditions samples of blood were taken from fifty-four subjects after they had followed a routine

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program to standardize outside influences. These blood collections were secured before and after the step-up exercise. As a result three readings, pre and post-exercise and transition, were obtained for each blood factor, making nine blood readings on every subject.

The hematological data were statistically compared in the divided as well as the selected groups and were also correlated with the total distribution of performance scores. Standard statistical procedures were used to express the findings.

Conclusions

a. Determination of Physical Condition

(1) The total distribution of college students used in this study yielded an unusually good sampling of physical condition. The normality is expressed by the P value of .998.

(2) The step-up exercise was an effective means of measuring physical condition in the students used in this study. Group comparisons show significant results to establish the validity of the exercise.

b. Analyses of Blood Factors in the Divided Groups

(1) All three blood factors, erythrocytes, hemoglobin and hematocrit, show significant increases as a result of exercise in the total distribution as well as the divided groups with only one exception in the latter. The Average group has the smallest red cell increase of the three groups.

(2) The Superior group shows the lowest mean values for all three blood factors in the pre-exercise state.

(3) The increase in the number of red cells in the circulatory system does not follow in proportion the increases of hemoglobin content and hematocrit volume as a result of the exercise. Cell fragility and blood dilution are offered as physiological possibilities to account for the inconsistency.

c. Relationship of Blood Status and Physical Performance

(1) Hemoglobin is the only blood factor that assumes statistical importance in relationship with performance scores. The correlations are negative in all three instances, indicating a relationship of high scores with low hemoglobin values.

(2) The multiple correlation of .632 obtained from the three hemoglobin — performance score relationships is a significant value, substantiating the marked negative relationships.

PHYSICS

BREMSSTRAHLUNG FOR HEAVY ELEMENTS
AT EXTREME RELATIVISTIC ENERGIES

(Publication No. 1544)*

Leon Bess, Ph. D.
University of Illinois, 1949

The work to be reported in this paper is essentially a correction to the Born approximation for high energy bremsstrahlung neglecting screening. The calculation here is somewhat different than the ordinary Born approximation one in that bremsstrahlung is treated as a first order process instead of the usual second order one. In the new calculation, the unperturbed wave functions are the coulomb solutions to the Dirac equation, with only the interaction of the particle and the radiation field as the perturbation term.

Unfortunately, it is not possible to obtain an exact coulomb solution to the Dirac equation in closed form with the momentum of the particle determinate at large distances from the nucleus. However, an approximate solution can be obtained which can be shown to give correct matrix elements at extreme relativistic energies.

At large distances from the nucleus, the exact coulomb solution, χ , to the Dirac equation can be written in the form:

$$\chi \sim e^{ip \cdot r + i\phi p(r)} [C_0 + C_1/pr + C_2/p^2r^2 + \dots] \quad (1)$$

where p is the particle momentum in units of mc ; r is the radius vector in (h/mc) ; $\phi p(r)$ is a phase factor; and the C 's are four component amplitudes which are functions only of Θ and ϕ . Now, it is found that the necessary requirement on the approximate coulomb solution is that, if expanded in the form of (1), it give correct coefficients for C_0 and C_1 but not necessarily higher C 's. (Or that it be correct to the order $1/r$ inclusive at large distances from the nucleus.)

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By using a variation of the method developed by Sommerfeld and Maue (1), the approximate coulomb solution satisfying the above condition can be found to be:

$$\chi_0 = N e^{ip \cdot r} \left(1 + \frac{\underline{\alpha} \cdot \nabla r}{2ip} - \frac{a}{2p} \frac{\partial}{\partial r} \right) u(p) F \quad (2)$$

where $a = Ze^2/\hbar c$; $F \equiv F(ia; 1; ipr - ip.r)$; $\nabla r \equiv (h/mc) \text{grad}$; N is a normalization constant; $\underline{\alpha}$ is the Dirac matrix operator; and $u(p)$ is the Dirac matrix coefficient of the free electron solution.

The matrix element, H'_{12} , involved in the bremsstrahlung differential cross section can be written as:

$$H'_{12} = C_a \int \chi_2^* \underline{\alpha} \cdot \underline{o}_\lambda e^{-ik \cdot r} \chi_1 d^3r \quad (3)$$

Where the subscript 1 refers to the initial state, and 2 to the final; the χ 's are wave functions of the form of (2); k is the momentum of the quantum in units of mc ; $C_a = -e \left(\frac{h}{mc} \right)^3 \sqrt{\frac{2\pi\hbar c^2}{L^3 k}}$; \underline{o}_λ is the unit polarization vector of the emitted quantum; and L^3 is the volume of the box in which the process is to be confined. After substituting the wave functions in (3) (and retaining only the significant terms), H'_{12} becomes:

$$H'_{12} = \left[(u_2^* T \underline{\alpha} \cdot \underline{o}_\lambda u_1) I_1 + (u_2^* T \underline{\alpha} \cdot \underline{o}_\lambda \underline{\alpha} \cdot I_2 u_1) + (u_2^* T \underline{\alpha} \cdot I_3 \underline{\alpha} \cdot \underline{o}_\lambda u_1) \right] \quad (4)$$

where

$$I_1 = C_a N^2 \left[\int e^{iq \cdot r} F_2^* F_1 d^3r - \frac{a}{2p_1} \int e^{iq \cdot r} F_2^* \left(\frac{\partial F_1}{\partial r} \right) d^3r - \frac{a}{2p_2} \int e^{iq \cdot r} \left(\frac{\partial F_2^*}{\partial r} \right) F_1 d^3r \right] \quad (5a)$$

$$I_2 = \frac{C_a N^2}{2ip_1} \int e^{iq \cdot r} F_2^* (\nabla r F_1) d^3r \quad (5b)$$

$$I_3 = -\frac{C_a N^2}{2ip_2} \int e^{iq \cdot r} (\nabla r F_2^*) F_1 d^3r \quad (5c)$$

(1) A. Sommerfeld and A. W. Maue, Ann. d. Phys., 22, 624 (1935)

where:

$$F_1 \equiv F(ia; 1; ip_1 \cdot r - ip_1 \cdot \underline{r}); F_2 \equiv F(ia; 1; ip_2 \cdot r - ip_2 \cdot \underline{r})$$

$$N_2 = \left[e^{\pi a} |\Gamma(1-ia)|^2 \right] \left[\frac{1}{L_3} \right]$$

$$\underline{q} \cdot \underline{p}_1 - \underline{p}_2 - \underline{k}$$

Now, it was found that by means of differential operators all of the I's can be generated from the integral:

$$I_0 = C_a N^2 \int \frac{e^{iq \cdot \underline{r}}}{r} F_2^* F_1 d^3 r \quad (6)$$

This integral I_0 can be evaluated exactly using a method somewhat similar to that of Sommerfeld (Ann. d. Phys., 11, 257). The result of this evaluation is then:

$$I_0 = \frac{4\pi C_a N^2}{q^2} \left[F\left(ia, -ia; 1; 1 - \frac{stq^2}{D_1 D_2}\right) \right] \left[\left(\frac{D_1}{D_2}\right)^{ia} \right] \quad (7)$$

where $D_1 = 2(k\epsilon_1 - \underline{k} \cdot \underline{p}_1)$; $D_2 = -2(k\epsilon_2 - \underline{k} \cdot \underline{p}_2)$; $s = -i(p_1 - p_2 - k)$; $t = -i(p_1 - p_2 + k)$; and ϵ_1 and ϵ_2 are the initial and final energies of the electron in units of mc^2 . Thus having I_0 , it becomes possible to evaluate H'_{12} completely.

Since the calculation being reported here differs from the ordinary Born approximation one only in the quantity H'_{12} , one proceeds exactly as before, (2) using the new H'_{12} to calculate first the differential cross section, then the total cross section (i.e. the cross section after both angular integrations have been performed on the differential cross section). (It should be noticed that the spur and closure theorems of the Dirac free electron solution can be used to perform the spin sums since H'_{12} is composed of the free electron coefficients $u(p)$.)

When all the necessary operations have been performed, the total cross section can be found to be:

$$\begin{aligned} \sigma k dk = \bar{\sigma} \frac{dk}{k} & \left(\frac{\pi a}{\sinh \pi a} \right)^2 \left\{ \left[\frac{8}{3}(1-w) + 2w^2 \right] \left[(2 \log 2\epsilon_1(1-w)/w) - 1 \right] V^2(n_1) \right. \\ & + 2 \left[(1-w) + w^2 \right] \left[a^2 V^2(n_2) + 4a^2 V(n_3) W(n_3) \right] + a^2 W^2(n_4) \left[\frac{4}{3}(1-w) + w^2 \right] \\ & \left. + a^4 W^4(n_5) \left[\left(\frac{8}{3} + w \right) (1-w) + \frac{4}{3} w^2 + w \right] \right\} \end{aligned} \quad (8)$$

(2) see for instance p. 163; Heitler; The Quantum Theory of Radiation (Oxford).

where $w = k/\epsilon_1$; $\bar{\sigma} = (Ze^2/137) (e^2/mc^2)$; $V(n) = F(ia, -ia; 1; n)$; $W(n) = F(1+ia; 1-ia; 1; n)$. The n 's are mean values which are complicated functions of a and w . n_1 is of the order of $1/(2\log 2\epsilon_1(1-w)/w)$, and all the other n 's are of the order of $1/2$. (Their exact form can be found in the unabridged article).

Using the conditions of a recent experiment (3), (8) was found to give a σ_k in fair agreement with the experimental one. Comparison here was only possible because w under the experimental conditions was large. This then implied deep penetration of the coulomb field so that screening could be neglected.

A qualitative study of (8) reveals some interesting facts. First, the correction to the Born approximation is always positive and for $\epsilon_1 > 30$ it is always less than 10%. Further, as ϵ_1 increases the percentage correction decreases so that the higher the energy, the more valid is the Born approximation answer. Finally, it is to be noticed that σ_k is independent of the sign of a . Thus, the cross section is the same for both electrons and positrons.

MOLECULAR STRUCTURE AND FAR INFRARED SPECTRUM OF METHYL ALCOHOL

(Publication No. 1483)*

Donald Burkhard, Ph. D.
University of Michigan, 1950

It has been observed by previous investigators that the near infrared spectrum of methyl alcohol exhibits characteristics of hindered rotation.(1) Hindered rotation between the hydroxyl and methyl group may be described by a three-fold sinusoidal-like potential, the maximum amplitude of which is called the barrier height. In the past it has not been possible to deduce a value for the barrier height due partially to the incomplete infrared data and partially because of the exceedingly complex manner in which the hindered rotation manifests itself.

In the present work the hindered rotation band has been measured from 20 to 200 . These data suggests a barrier height of about 300 cm.^{-1} , but the assignment of a more exact value does not seem feasible working from the infrared alone.

It has been possible to approach the barrier height problem

(3) L. H. Lanzl, J. S. Laughlin, and L. S. Skaggs; Phys. Rev.; 74, 1261 (1948).

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from an entirely different point of view by making use of microwave measurements. Microwave transitions are characterized by changes in overall rotation, but in the case of methyl alcohol, such effects are modified by internal transitions associated with the hindered rotation. By making use of a symmetric top theory(2) a fairly precise value may be obtained for the barrier height from the microwave spectrum. In order to specify further the barrier and to account for the fine structure in the microwave region, however, it is necessary to include all elements of asymmetry present in the molecule. In the present study this has been done by solving the wave equation for the case in which the hydroxyl group is treated as a rigid bar (asymmetric rotator), turning about the symmetry axis of the methyl group (rigid symmetric rotator), and subject to the three-fold hindering potential.

The solution is applied to the microwave data and the barrier height is found to be about 326 cm.^{-1} . It has also been possible to deduce values for four other independent molecular constants by making use of the microwave measurements. The values for the parameters so deduced are used to predict the hindered rotation spectrum. The results are found to be in reasonable agreement with experiment.

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A STUDY ON THE DECAY SCHEMES OF Au^{198} AND Hf^{181}
BY MEANS OF A BETA-RAY SPECTROMETER AND
COINCIDENCE MEASUREMENTS

(Publication No. 1507)*

Kuang-Ya Chu, Ph.D.
University of Michigan, 1950

The problem is concerned with the measurements of some of the radiation properties of the radioactive nuclei Au^{198} and Hf^{181} , both of these being electron and gamma-ray emitters. The study then consists of the determination of the distribution of the beta-spectrum, the maximum energy of the β -disintegration, the energies of the various gamma-rays emitted during the decay and their internal conversion coefficients, and then the decay scheme.

A semi-circular focusing beta-ray spectrometer of 2 per cent resolving power was used to study the beta- and conversion-electron spectrum, and also the secondary electron spectrum. The complexity of the beta-spectrum was investigated by applying the Fermi analysis to its distribution. Energies of the gamma-rays and their conversion properties were then determined from the beta- and secondary electron spectrum. In addition, $\beta-\gamma$, $\gamma-\gamma$ and $\beta-e^-$ -coincidence measurements were also performed. The data thus obtained were used to check the complexity of the beta-spectrum, to determine the total conversion coefficients of the gamma-rays in certain cases, and finally to verify the various possible decay schemes.

The radiations from Au^{198} were found to consist of a simple β -spectrum with a maximum energy of 0.966 Mev, an intense γ -ray of 0.401 Mev which is partially converted. The data from the spectrometer studies revealed a total conversion coefficient of 0.039 ± 0.002 for this γ -ray, while the coincidence measurements yielded a value 0.0470 ± 0.0024 . Evidences for the existence of two low energy γ -rays, 0.157 Mev and 0.208 Mev, with relative abundance less than 5 per cent were also obtained. It was then proposed that these two γ -rays are emitted in cascade after the K-electron capture process, which takes place in parallel to the β -disintegration process.

In the case of Hf^{181} , it was found that it emits four partially converted γ -rays, with energies 0.130, 0.134, 0.337, 0.471 Mev

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respectively, and a simple β -spectrum of 0.406 Mev. An estimate of the relative intensities of the two higher energy γ -rays was made from the Compton and photo-electron intensities. Together with the well-known fact that there exists a metastable state of half-life 22 micro-seconds during its decay, a possible decay scheme which might account for most of the observed facts was proposed.

The method of investigation was proved to be successful in so far as the study of the energy level diagram of radioactive nuclei is concerned. The analysis of a beta-ray spectrometer of high resolution is adequate in the determination of the energy and the distribution of the various β - and γ -ray components. On the other hand, the findings from the coincidence measurements are important references when the order of emission of these various radiations is to be determined.

ON THE SHOCK TUBE AS A TOOL FOR THE INVESTIGATION OF FLOW PHENOMENA

(Publication No. 1511)*

Frederick William Geiger, Ph. D.
University of Michigan, 1950

The flow between the shock wave and the contact surface in a shock tube theoretically is uniform and can be made subsonic, sonic, or supersonic. If this flow passes over a model, the resultant flow will vary with time, approaching that in the wind tunnel. If the time duration of the flow is sufficiently long, substantially steady states will result. Photographs of their formation should yield information regarding partially understood phenomena of steady state aerodynamics.

This is a study of the nature and aerodynamic potentialities of the flow between the above discontinuities in the tube used by Smith¹ and by Mautz.²

The mathematical model for idealized flow in the tube is given; and the pertinent conclusions of Mautz, regarding this flow are reviewed.

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1. Smith, L. G. Photographic investigation of the reflection of plane shocks in air. NDRC Report No. A-350, OSRD Report No. 1140, 1943.
2. Mautz, C. W. The use of the shock tube in the production of uniform fields of transonic and supersonic flow. Dissertation, University of Michigan, 1949.

A photographic investigation of the relation between the rupture of the cellophane diaphragm and the formation of the primary shock wave indicated that observed discrepancies between calculated and actual performance of the tube are primarily due to the non-ideal removal of the diaphragm.

In order to determine the type of experiment which can be performed in the tube flow, exploratory shadowgraphs were taken of flows past two-dimensional models.

Experiments initiated to demonstrate starting vortices showed that the shock wave usually associated with overexpansion at a corner in supersonic flow is due to viscous effects.

Tests of the choking of a duct at a Mach number of 1.16 indicated that the tube has considerable potentialities in the low supersonic range of Mach numbers. There was no indication of choking of the tube although a wind tunnel would undoubtedly have been choked under similar conditions. This is believed to be partially due to a thin boundary layer in the tube.

In transonic tests using a symmetrical double wedge of length 2.6 inches and with a thickness ratio of 10 per cent nearly steady flows were obtained with the oncoming flow either supersonic or subsonic. A shorter model could have been employed to advantage as far as the formation of these flows is concerned.

In these tests some of the shock wave configurations observed by investigators in this field were photographed. Also, photographs indicated that the oblique shock which occurs at the nose of a supersonic airfoil, in conjunction with a detached shock wave, would exist in a non-viscous fluid in which shock waves were allowed.

At initial Mach numbers below unity but such that choking would occur, the shock configurations in the early flows were similar to those at lower Mach numbers. It may be possible to draw conclusions regarding phenomena in free flight at these Mach numbers from tests in the shock tube.

The general conclusion is that the shock tube is a highly useful tool for the investigation of flow phenomena.

AN INVESTIGATION OF SHORT DURATION
ARCS IN RARE GASES

(Publication No. 1515)*

Gordon Dunwell Hoyt, Ph.D.
University of Michigan, 1950

Some of the factors affecting the maximum intensity and the duration of visible light from discharges through argon, krypton, and xenon were experimentally determined. The gases were used at pressures from approximately ten to fifty centimeters of mercury in a discharge tube with low work function electrodes and a 1.2 centimeter gap length. The discharge tube was connected to condensers ranging from 0.01 to 0.50 microfarads which were allowed to discharge through the tube after being charged to voltages up to 4700 volts. The current in the discharge tube and condenser was an exponentially damped sine wave of up to 4700 amperes maximum value and 3.5 megacycles per second frequency. The damping of the current was so high that it reached zero after a few oscillations. The light emitted by the discharge in the visible region reached a maximum about 0.05 microseconds after the current maximum and decayed rapidly thereafter.

The visible light intensity as a function of time was determined by a photoelectric cell and cathode ray tube. The current was determined by coupling to the cathode ray tube a signal induced by the discharge tube current, thereby measuring the frequency and damping of the current and calculating the current function on the assumption that it was an exponentially damped sine wave. The ohmic resistance of the discharge tube was also obtained from these calculations.

It was found that the maximum intensity of visible light from these condensed discharges, for each gas, pressure, and capacitance, is a linear function of the energy dissipated in the discharge tube. This was shown by varying the energy available to the discharge by means of the voltage to which the condenser was charged, and assuming the fraction of the available energy dissipated in the discharge tube is determined by the apparent ohmic discharge tube resistance and the total discharge circuit resistance. It was also found that the intensity of visible light is approximately proportional to the atomic number of the rare gas and to the frequency of the

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discharge current. The addition of hydrogen to krypton increased the intensity of visible light in proportion to the partial pressure of hydrogen.

The duration of the visible light from the discharge, arbitrarily defined as the time during which the light intensity was greater than one fifth of its maximum value, is found to be unaffected by gas, pressure and voltage and nearly a linear function of the period of the oscillating current. It was found that the duration is increased by the addition of inductance to the discharge circuit (current frequency constant). The duration was slightly decreased by the addition of about twenty per cent hydrogen to krypton. The duration was not decreased by the addition of resistance to the discharge circuit to increase the damping of the current.

The exponential damping of the current indicates that the discharge circuit behaves like a simple resistance, inductance, and capacitance series resonant circuit in which the resistance is approximately constant, and most of this resistance can be assigned to the discharge tube. The discharge tube resistance depends on the capacitance of the discharge circuit and the voltage to which it was charged. For small capacitances, the product of the discharge tube resistance and the square of the voltage is nearly constant.

The experimental results are compared to other research on similar gaseous discharges. The spectrum of the light from the discharge and the effect of the discharge path length were not investigated.

AN INVESTIGATION OF THE ALPHA-RAY SPECTRUM OF POLONIUM

(Publication No. 1526)*

John J. Wagner, Ph. D.
University of Michigan, 1950

W. Y. Chang has observed a series of low energy groups of alpha particles in the spectrum of polonium which are in apparent conflict with the accepted theory of alpha disintegration, and which have a total intensity considerably greater than that to be expected from observation of the gamma spectrum. An independent investigation by W. G. Wadey did not confirm these groups but showed an apparent dependence of the contour of the continuous background on the backing material of the radioactive source. The questions

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outstanding are: (1) Can groups like Chang's be reproduced? (2) Are they nuclear in origin? (3) What is the effect of the backing material?

In this work a semi-circular-focusing magnetic spectrograph (main group radius of 23 cm and resolving power of 1/4%) was employed with nuclear track photographic plate detection. A source with a silver backing was investigated intensively, and more than 30 groups were found between 3.85 Mev and the main line at 5.3 Mev. Spot checks with a variety of sources have shown the groups to be quite reproducible in energy, particularly in the upper half of this region, but variable in relative intensity. Their peak height above the continuous background is a roughly constant fraction of its level. The sources used were of different strengths, thicknesses, and ages, and backings of silver, nickel, and thin organic films were employed. In general the contour and level of the background was found to correlate qualitatively with the estimated source thickness and to be independent of the backing material and the age of the source. However, the residual background with the thinnest sources cannot be accounted for in a straightforward manner. Investigation of instrumental and procedural factors showed no appreciable effects. The momenta were measured to better than 0.1%, and the statistical accuracy in determining the intensities was about 5%.

It is concluded that the group structure does exist, and is not an occasional occurrence. The groups observed so far are not directly nuclear in origin and no satisfactory explanation of them is apparent. The structure is independent of the source backing, and, in particular, the hypothesis of the diffusion of the polonium into the backing material is untenable. The appearance of groups of this type under such various circumstances (Chang observed a similar spectrum for Ra) suggests the possibility that some of the short range alpha lines of other elements, now considered established, may be of this non-nuclear nature.

PSYCHOLOGY

THE ROLE OF EFFORT IN LEARNING AND EXTINCTION

(Publication No. 1501)*

Mortimer H. Applezweig, Ph.D.
University of Michigan, 1950

This experiment was performed as a test of the hypotheses that (1) habit strength is a positive function of effort and that (2) the generalization of response-produced stimulation increases the performance of positive habits.

Five groups of 20 rats were trained to press levers requiring 10, 20, 30, 40 and 50 grams of effort in order to obtain water. After 50 reinforced trials the groups were sub-divided into five groups of four rats and each sub-group was extinguished at one of the five effort levels.

It was found that the greater the effort involved in the execution of a task the longer it takes to learn and the more difficult it is to learn.

In confirmation of previous research it was also found that, when training was equated for number and difficulty of trials, rate of extinction was a positive function of effortfulness of task during extinction.

When extinction conditions were equated by averaging scores over all five effort levels it was found that rate of extinction was positively related to effortfulness of task during learning. This finding has not been predicted by any existing theory and an addition to current theory is suggested as an explanation of the results.

Evidence for the generalization of response-produced stimulation was found to be consistent throughout the data, but the statistical significance of the results could not be demonstrated because of the lack of appropriate statistical techniques.

The data would appear to permit the following conclusions:

1. The more effortful the performance of a task the greater the time required to learn the task.
2. The more effortful the performance of a task the greater the probability of failure to learn.
3. The more effortful the performance of a task the better will it be learned.
4. When habit strength is constant, the more effortful the performance of a task after reinforcement has been removed, the more rapidly will extinction occur.

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THE INFLUENCE OF VARIED EXPERIMENTAL SETS UPON
CERTAIN RORSCHACH VARIABLES: I STABILITY OF
THE INTELLECTUAL VARIABLES

(Publication No. 1512)*

Robert Gwyn Gibby, Ph.D.
University of Michigan, 1950

This is a study of the stability of the variables of the Rorschach which presumably measure intellectual traits, (W, (D/Dd)%, F+, A%, Content Category and R), under various experimental sets. The major questions investigated were: (1) To what extent are the scores on the "intellectual variables" of the Rorschach test modifiable when the subject is given a brief specific instruction to alter his score?; (2) Is there any type of relationship between configurations of Rorschach scores and the amount of change in the (D/Dd%) variable?; (3) What concomitant changes occur in the "emotional variables" when changes occur in the "intellectual variables?"

The experiment was carried out upon a group of 84 college students enrolled in a general introductory psychology course and randomly selected from the population of the course. Each individual was given the Rorschach twice, within approximately a two week interval, the first time under "standard" conditions and the second time under one of the several experimental conditions. Twenty-seven examiners participated in the experiment. Both examiners and experimental conditions were randomized for the subjects. Before scoring the records, by two independent examiners, all identifying information, relating to the subject and experimental conditions, were deleted. The four types of retests were as follows: Condition I, (Control), standard situation; Condition II, (D and Dd), subject asked to "tell everything he saw" and in addition to pay particular attention to the segmented areas of the blot; Condition III, (M), subject asked to "tell everything he saw" and in addition to find as many human movement responses as he could; Condition IV, (F+, FC, and H), subject asked to give only good form, combined form and color, and human responses.

The major conclusions drawn are:

1. The scores on the presumed "intellectual variables" are not stable. The lack of stability is demonstrated under (A) Retest conditions; (B) When opportunity for change in the "intellectual

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variables" is maximized; (C) When opportunity for change in the presumed "emotional variables" is maximized; (D) Under conditions of conflicting set.

2. Change in the "intellectual variables" may be made at a conscious and volitional level.

3. All the presumed "intellectual variables" are not equally stable. Most stable under the retest condition are the F $\neq\%$, A%, Content Category and R variables. The least stable are the W and (D \neq Dd)% variables.

4. There is no intrinsic relationship between the presumed intellectual and emotional variables.

5. The (D \neq Dd)% variable is relatively more unstable in personalities characterized as "rich and mature." Such personalities are able to adapt more readily to varying test conditions.

6. The individual who is relatively more stable in the (D \neq Dd)% variable may be differentiated from the individual who is relatively less stable by means of a "Stability Score" in all groups except that one in which a conflicting set is given.

The major implications are:

1. The norms developed for the W:D:Dd relationships (Approach) are not applicable in the case of a re-test within a "short time interval."

2. Changes in the W and (D \neq Dd)% variables in a Rorschach repeated for the purposes of evaluating progress in psychotherapy may not be entirely attributed to the effects of therapy.

3. An individual may erect a facade both conscious and unconscious, so that test results do not necessarily reflect the true personality structure.

4. The "intellectual variables" as manifested by the Rorschach are representative of surface rather than source traits.

5. The stability of the "intellectual variables" measured are inversely related to the adaptability of the defense network. The more adaptable the defense network, the less stable are the "intellectual variables."

6. In the clinical usage of the Rorschach, one may aid in the more accurate appraisal of the significance of the "intellectual variables" in the employment of the "Stability Score."

7. A score on one of the Rorschach "intellectual variables" may be adequately interpreted only when the precise external and possibly internal conditions under which the test was administered are known.

8. A score on one of the Rorschach "intellectual variables" may be adequately interpreted only in light of knowledge concerning the particular population from which the subject is drawn.

THE INFLUENCE OF VARIED EXPERIMENTAL SETS UPON
CERTAIN RORSCHACH VARIABLES: II STABILITY OF
THE HUMAN MOVEMENT VARIABLE

(Publication No. 1521)*

E. Ohmer Milton, Jr., Ph. D.
University of Michigan, 1950

This study, one part of a larger undertaking designed to answer several general questions about the Rorschach Technique, was concerned primarily with the volitional modifiability of the human movement response. It is believed by many that this Rorschach variable is most resistive to external influences and forces.

The main hypothesis tested was that the mean number of "M" responses would not increase when a group of subjects was requested to see more of them. It was also hypothesized that there would be no corresponding changes in certain other Rorschach variables: W, F^{1%}, A%, number of content categories, sum C, sum Y, and S. In addition, an effort was made to ascertain differentiating Rorschach characteristics of those who changed most in "M" and those who changed least.

Subjects, undergraduate students at the University of Michigan, were assigned randomly to four groups. The Rorschach was administered twice to each of them by graduate students who were enrolled in a course entitled "Projective Theory and Technique." Approximately two weeks after the first examination, the second one was administered. Subjects in the Control Group merely repeated the test. Those of Experimental Group I were asked to see as many parts (D and Dd) as possible; those of Experimental Group II were requested to see as many "M's" as possible; those of Experimental Group III were asked to give F¹, FC, and H responses. After a number was assigned to each record from a Table of Random Numbers, and identifying data were removed (by an assistant), the records were scored according to Beck's system (by two experimenters.)

Analysis of the data revealed that the mean number of "M" responses increased more than one would expect by chance when subjects were requested to see more of them. Such "M's" were those which are commonly believed to be rich meaningful ones and indicative of basic psychologic activity. There were no corresponding significant alterations in the other variables studied, with the

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exception of a marked decrease in A%. There was a tendency for decrement in sum C.

The mean number of "M" responses did not change significantly in the other three groups, although there were marked fluctuations in "M" scores for some subjects.

There were marked shifts in both direction and "type" of the Erlebnistypus in both the control and experimental groups.

A Rorschach score was derived which showed a statistically significant difference between those who changed "most" in "M" in the repeat test, and those who changed "least."

It was concluded that:

1. The human movement response is not a stable variable for all individuals. An externally imposed "set" is an important factor in determining the number of "M's" which will be produced.

2. The Erlebnistypus is highly unstable for some individuals. Clinically, both an externally imposed "set" and chance factors determine the "type" of the Erlebnistypus.

It was emphasized that for more adequate Rorschach interpretations, many other factors than those which appear in a record must be considered. The suggestion was made that the general milieu in which the examination was conducted, the "frame of reference" of the subject, any pleasant or traumatic event prior to the examination, and other influences, be evaluated in any interpretation of a specific record.

Several problems relating to the Rorschach were suggested as being worthy of research endeavors.

A STUDY OF THREE COMMON FUNDAMENTAL FACTORS IN THE DEVELOPMENT OF PSYCHOLOGICAL COUNSELING IN THE UNITED STATES

(Publication No. 1496)*

Josephine Hinman Ross, Ph.D.
New York University, 1949

This study shows the contributions of clinical psychology, psychiatry, and certain Freudian concepts as common fundamental factors in the development of psychological counseling which is represented by the directive method as described by Thorne, the nondirective as defined by Rogers, and the analytic as used by Blos.

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The dissertation traces the development and growth of psychological counseling from clinical psychology, shows the close relationship to psychiatry, and demonstrates a universal indebtedness to eight Freudian concepts.

In the preparation of the thesis an intensive study was made of literature appearing after 1879, the year in which contributions appeared which served to organize psychology into a science. The bibliography collected numbered approximately eleven hundred references, of which more than seven hundred were used in the actual preparation of the study.

The evolution of Clinical Psychology is traced from the time of its founding to the present. It is noted that, in the year 1935 neither psychotherapy nor psychological counseling was considered to be the function of the clinical psychologist, according to the Report of the Committee of the Clinical Section of the American Psychological Association, yet such was the development along these lines that in 1947 definite provisions were made for training in counseling for the clinical psychologist by the adoption by this Association of the "Recommended Graduate Program in Clinical Psychology" proposed by the Committee on Training in Clinical Psychology.

The impetus given psychological counseling by recent demands of the Veterans Administration and the Passage of the National Mental Health Act is discussed, and a brief resume is made of the development of psychological counseling in the areas of the college and university, the school, the child guidance clinic, the rehabilitation clinic, the hospital, industry, correctional institutions and private practice. The resultant need for a professional code and for certification of psychologists is presented.

The close relationship between psychological counseling and psychiatry is established by showing that Freud, by his contribution of psychoanalysis, built the bridge which joins psychology and psychiatry in the founding of a dynamic psychology common to both.

The interrelationship between psychological counseling and psychiatry is traced historically from the standpoint of common ground in clinical functions, in proposed preparation and training for the two professions, in research activities of interest to both, and in occupational parallels.

Likewise, it is shown that there are eight Freudian concepts which the directive, the nondirective, and the analytic schools of psychological counseling recognize in common. Their relative indebtedness varies with the frame of reference accepted by each school. However, all accept to some extent the following Freudian concepts: Recognition of a state of conflict, acknowledgment of the unconscious, the role of repression, the dependence on transference, the acquiring of insight, emphasis on release, the idea that the person is the center of therapy, and the accepting and objective attitude on the part of the therapist.

The significant contribution of this thesis is a unification of the different points of view expressed by the non-directive, the directive, and the analytic techniques of psychological counseling. There is gathered within the bounds of one document a collation of information of value to individuals at present practicing clinical psychology, and to anyone considering a career in psychological counseling; for the thesis brings to a focus, and traces, the historical development of factors common to the directive, the non-directive, and the analytic viewpoints in contrast to the emphasis on the differences between these techniques which has been stressed in many articles appearing between the years 1944 and 1949.

There is presented, finally, a resume of the comparative clinical backgrounds of the three representatives, the comparative relations of the three schools to Freudian psychology, suggestions for training proposed by each, a discussion of the problem of personal psychoanalysis, a brief evaluation of the present schools, and a final proposal for a "true" eclectic school of psychological counseling.

**AN EVALUATION OF RATINGS OF PERSONALITY
TRAITS ON THE BASIS OF UNSTRUCTURED
ASSESSMENT INTERVIEWS**

(Publication No. 1525)*

**Ernest C. Tupes, Ph.D.
University of Michigan, 1950**

In the course of an intensive assessment program, 128 male first-year graduate students in clinical psychology were rated by trained professional persons on 31 personality variables and 11 "future performance" variables after being interviewed in two types of interview situations; the first, a one-hour Initial Interview situation with only credentials material available before the interview; and the second, a two-hour Intensive Interview situation with credentials material, objective test profiles, projective protocols, and autobiographical material available before the interview. The validity of ratings based on these two interview situations was determined by correlating these ratings with criterion ratings arrived at by a team of three psychologists who had intensively studied each subject for a period of one week.

It was found that:

1. Ratings made after both the Initial and Intensive Interview

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situations correlated with the criterion ratings on a better than chance basis for all variables.

2. Ratings made after the Intensive Interview situation were more valid than ratings made after the Initial Interview situation.

3. There was little difference in the contribution of the two types of interviews to the validity of ratings of personality traits, and the contribution of either was slight.

4. Significant differences were found in the validities of ratings by the different interviewers and in the validities with which the variables were rated after each interview situation.

5. There was a slight positive relationship between ability to rate after the Initial Interview situation and after the Intensive Interview situation.

It was concluded that the incremental validity of the interview as an instrument for the assessment of personality traits is slight, and that longer interviews have little, if any, more incremental validity than have shorter interviews; that there are individual differences, relatively independent of the length of interview and amount of written data available, in the ability to make ratings of personality traits; and that, at the present time, even skilled clinicians, having available a wide variety of objective test data, projective protocols, credentials material, autobiographical data, plus a face-to-face interview, do not appear to be able to make personality assessments, in the form of ratings of personality traits, which have validity as high as is needed in individual case work.

RADIO BROADCASTING

FACTORS IN THE ATTEMPTS TO ESTABLISH A PERMANENT INSTRUMENTALITY FOR THE ADMINISTRATION OF THE INTERNATIONAL BROADCASTING SERVICES OF THE UNITED STATES

(Publication No. 1495)*

Burton Paulu, Ph.D.
New York University, 1949

It is the purpose of this thesis to offer recommendations regarding the establishment of a permanent instrumentality for the administration of the international broadcasting services of the United States. For the most part, the study is an historical survey of the proposals advanced and the attempts made since the end of World War II to establish such an agency, together with an appraisal of the various formats available for it. The thesis is based mainly upon such United States Government sources as Congressional hearings, reports, and debates, as well as upon the data obtained through personal interviews. There are no secondary sources which treat fully of more than a few aspects of this subject.

The thesis provides a detailed review of the legislative history of the State Department appropriation bills during this period insofar as they bear upon the question at hand. A similar analysis is made of the United States International Information and Educational Exchange Act of 1948, which provided basic legislation for United States international information activities. Other subjects reviewed include the international broadcasting foundation proposal sent to Congress by the State Department in 1947, and the Congressional investigation of the "Know North America" broadcasts which led to the withdrawal of private networks from short-wave programming in 1948.

The thesis also deals with the objectives for United States Government international information activities. The aims established in the United States Information and Educational Exchange Act of 1948 are qualified and interpreted in the light of the pronouncements made by those members of the executive and legislative branches of the government who have been concerned with the formulation and application of international information policies. The objectives thus defined are as follows: To promote better understanding between the people of the United States and those of other countries;

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to disseminate abroad information about the United States, its people, and its official policies; to implement the foreign policy of the United States; and, during the present ideological war, to present the case for democracy in reply to attacks from Communist sources.

It is pointed out that four procedures have been proposed for the administration of this country's international broadcasting services: (1) private commercial operation; (2) joint private-government operation; (3) operation by an international broadcasting foundation; and, (4) operation by the Department of State. These alternatives are appraised in terms of the defined objectives for international broadcasting, in order to choose from them a temporary entity for use during the present Cold War period, and a permanent instrumentality for less anxious times. This process leads to the following conclusions: (1) Private operation is impossible, because it is not self-supporting, and because it can not adequately coordinate the division of time and frequencies among the various stations concerned. (2) Joint private-government operation is not feasible because of the administrative problems which would result from a division of program responsibility. (3) Although an international broadcasting foundation is not recommended for the present, when a close coordination of the nation's foreign policy and its international broadcasting output is desired, this is the author's choice as a permanent administering entity for the time when normal international exchanges replace the present ideological warfare. The author recommends alternative (4) — operation by the United States Department of State — as the best temporary procedure for use under present world conditions.

ZOOLOGY

PHYSIOLOGICAL AND BEHAVIOR RESPONSES OF SMALL MAMMALS TO CHANGES IN AIR TEMPERATURE

(Publication No. 1558)*

John Arthur Selander, Jr., Ph.D.
University of Illinois, 1949

The importance of temperature as an environmental factor affecting the behavior, physiology, and ecological relationships of various organisms has long been recognized. Not much attention has been devoted, however, to the slow adjustments which various species make to changes in temperature for which the term "acclimation" is customarily employed.

The principal species studied were the northern white-footed mouse, Peromyscus leucopus noveboracensis (Fischer), and the prairie deer mouse, Peromyscus maniculatus bairdii (Hoy and Kennicott), and an effort was made to determine their absolute limits of tolerance to high and low temperatures, their means of resisting extreme temperatures, and their adjustments in behavior and physiology to changes in air temperature.

Survival times of deer mice deprived of food and water were determined at different temperatures using various constant temperature chambers, cabinets, and rooms all of which were accurate to within $\pm 1^{\circ}$ C. Pelages of mice were measured quantitatively by means of hair follicle counts, and weights were recorded to the nearest 0.1 gram on a triple beam balance.

Winter noveboracensis survived longer than summer noveboracensis in the range of temperature from -35° C. to $+35^{\circ}$ C., while summer animals survived longer at 40° and 50° C. Longer survivals of winter animals were correlated with increased weight in the form of fat, a denser pelage, and a reduction in the hourly rate of weight loss. Summer animals lost weight more rapidly at all temperatures below and including the optimum and had smaller fat deposits and a thinner pelage than winter animals.

Laboratory-reared and -bred bairdii acclimated at low temperatures survived much longer at -20° C. than animals acclimated at high temperatures. Animals acclimated at summer temperatures outdoors

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survived longer at 40° C. than animals acclimated at winter temperatures outdoors.

Nest-building and huddling constitute thermoregulatory activities which are enhanced at low and reduced at high temperatures, and behavior adjustments of this sort may increase toleration of low temperatures during winter. Behavior responses to low temperature such as shivering and erection of fur were of immediate value in increasing each species' tolerance to low temperature, while the assumption of extended postures was of value at high temperatures.

Temperatures of mice were taken by means of a portable indicator potentiometer and a self-recording potentiometer using copper-constantan thermocouples. Standard body temperatures of noveboracensis ranged from about 37° to 38° C., while basal temperatures ranged from about 35.5° to 37.5° C. The lower lethal temperature was between 43° and 44° C. The average deep throat and subcutaneous temperatures of noveboracensis appeared to be independent of environmental temperatures when the animals were well supplied with food and water. Subcutaneous temperature was generally about 0.5° to 1.0° C. lower than deep throat temperature.

Food consumption of Peromyscus varied inversely with air temperature. An initial period of adjustment in food consumption took place which was most rapid at low temperatures and was characterized by increasing appetite. A slower adjustment accompanied by decreasing appetite took place at high temperatures.

These experimental results, when interpreted in terms of average temperatures at the northern limit of each species' range during the coldest part of the winter, indicate that small mammals may be limited in their northward distribution by their inability to tolerate extreme low temperatures. The January isotherm of -12° C. for mean monthly temperature is correlated with the northern boundary of the range of noveboracensis, and the isotherm of -21° C. with the northward extension of the range of bairdii which agrees with the greater tolerance of this species to low temperature that was demonstrated experimentally. Both species may be limited more directly by daily minimum temperatures.

ANALYSIS OF SMALL MAMMAL POPULATIONS IN THE DECIDUOUS FOREST BIOME

(Publication No. 1564)*

Ralph Martin Wetzel, Ph.D.
University of Illinois, 1949

To test the accuracy of live-trapping methods for measuring population densities of small mammals, live-traps were spaced at varying intervals in three separate five-day trapping periods. It was found that decreasing trap intervals progressively increased estimates of population density of Peromyscus leucopus noveboracensis and that 41-foot trap intervals were necessary in a five-day period.

Variations in estimating population levels due to adjustments made in quadrat size to allow for movements of animals living on the periphery of the census quadrat were analyzed. Adjusting the census quadrat on the basis of one-half the maximum distances across individual movement areas yielded lower population densities than did methods based upon actual area of movement areas.

Two variations of the Petersen index were applied to data from eight live-trapping periods of varying trap interval and different levels of population. Results showed that the index roughly estimates total mice on a quadrat before the end of the full trapping period and provides some evaluation of adequacy of trapping.

Comparison of live- and snap-trapping censuses yielded similar results for adult and young adult Peromyscus leucopus and Microtus ochrogaster. The greater efficiency of snap-traps for shrews and the heavy mortality of shrews in live-traps showed snap-trapping procedures to be superior to live-trapping methods in censusing these forms.

Three areas representing stages in the development of a deciduous forest on stripmined land in Illinois and a mature floodplain forest which had not been subjected to stripping operations were studied to determine mammalian succession. A large population of Peromyscus maniculatus bairdii was established within seven years after stripmining. As briars, vines, grasses, and small trees spread throughout the area, Microtus ochrogaster, Blarina, Synaptomys, Zapus, and Scalopus became the principal inhabitants, and

* Microfilm copy of complete manuscript of 147 pages, \$1.84.
Enlargements, 6" x 8", 10¢ per page. Library of Congress
Card Number Mic A 50-69.

bairdii was replaced by P. leucopus noveboracensis. With change from open forest-edge to forest, the population of P. leucopus increased, the characteristic grassland forms decreased, and only Blarina and Scalopus persisted. As succession on the stripmine floodplain proceeds to the climax, higher populations of P. leucopus occur.

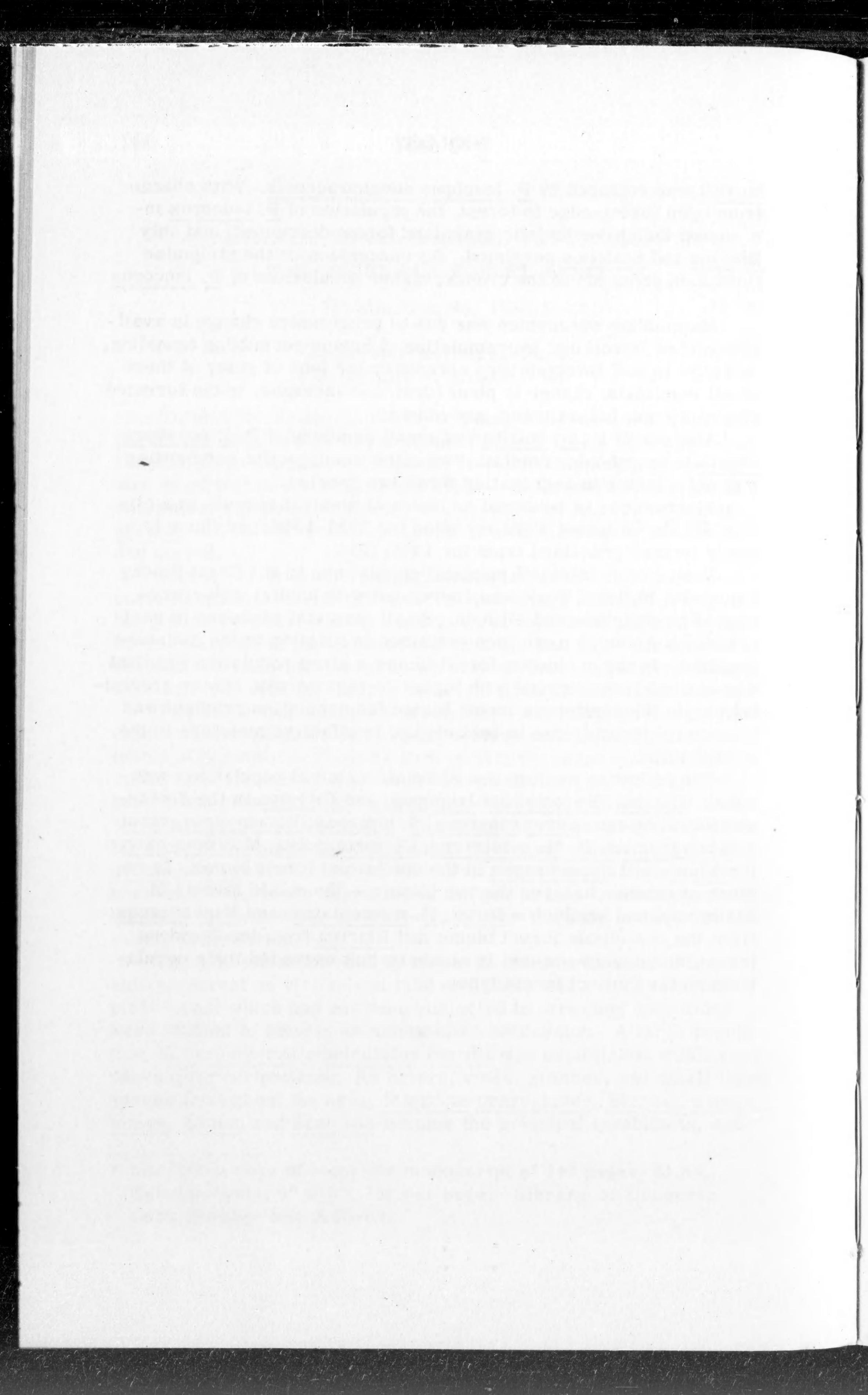
Mammalian succession was due to progressive change in available niches, involving: Accumulation of humus permitting tunneling, increase in soil invertebrates necessary for food of many of these small mammals, change in plant form, and increase, in the forested stage, of logs, hollow trees, and stumps.

Absence of P. m. bairdii and small numbers of P. l. noveboracensis in forest-edge habitats, indicated interspecific competition was not a factor in segregating these two species.

Fluctuations in autumnal numbers of small mammals in a climax deciduous forest were reported for 1936-1948, and those in a newly formed grassland tract for 1944-1948.

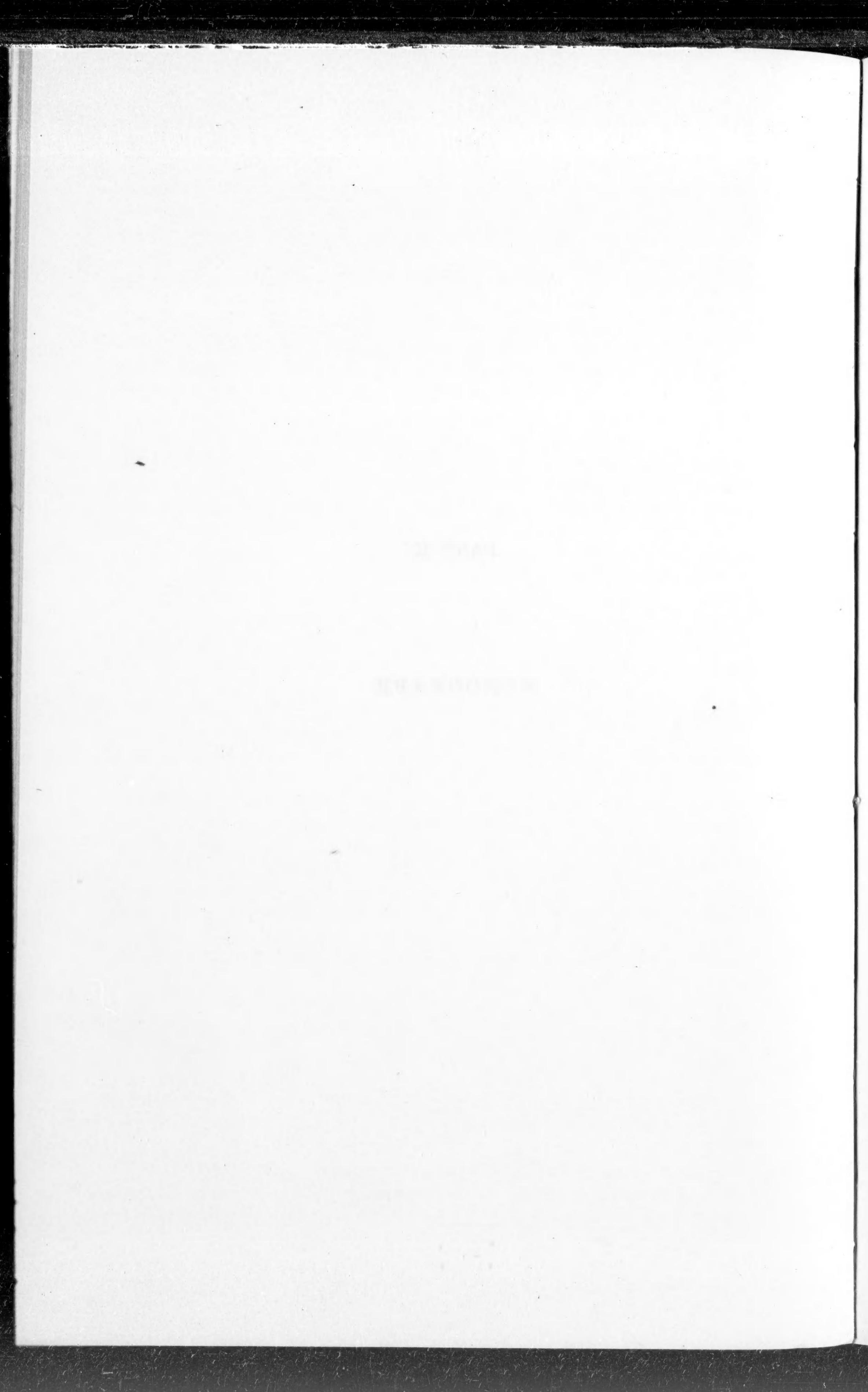
Distribution of small mammal populations in the Great Smoky Mountains National Park was correlated with habitat differences caused by moisture and altitude. Small mammal censuses in eastern North America were then examined in relation to the moisture gradient. In the deciduous forest biome a steep population gradient was noticed from regions with higher to regions with lesser precipitation. In the coniferous forest biome the population gradient was less steep probably due to less change in effective moisture in the microhabitat.

The following segregation of small mammal populations was noted: Blarina, Peromyscus leucopus, and Pitymys in the deciduous forest biome; Sorex cinereus, S. fumeous, Peromyscus maniculatus gracilis, P. M. nubiterrae, Clethrionomys, Microtus chrotorrhinus, and Napaeozapus in the coniferous forest biome. In regions of ecotone between the two biomes — the mesic forests of hardwoods and hemlock — Sorex, P. maniculatus, and Napaeozapus from the coniferous forest biome and Blarina from the deciduous forest biome were present in numbers that exceeded their populations in the distinct forest types.



PART II

MONOGRAPH



LANGUAGE

THE DIALECTS OF ANCIENT GAUL

(Publication No. 1571)*

Joshua Whatmough, M.A.
University of Cambridge, England, 1926

This work collects all the evidence pertinent to the linguistic situation in pre-Roman Gaul, together with such comment and interpretation as is necessary and justified. Prolegomena were published in the Harvard Studies in Classical Philology 55, 1944, 1-85, where the geographical distribution of the material is indicated on p. 22.

The work falls into two divisions, I The Records of the Dialects and II Commentary, Grammar, Glossary, and Indexes. The Records are classified under the following headings: Alpine Regions, Narbonensis, Aquitania, Lugdenensis, Belgica, Germania Inferior, Germania Superior (west of the Rhine), the Agri Decumates with the upper Rhine and Danube.

It is proposed to release the documentary evidence, part by part, in microfilm. The contents of this present first part are as follows:

Map to show Provenances, with an Index of Sites and a Key to the Map

	Pages
I. ALPINE REGIONS	
A. 1. Glosses	31-38
Note on Glosses	
B. Ethnic, Local, Divine, and Personal Names, viz:	
2-6 (with Notes i-ii) 1. Alpes Maritimae	39-44
7-9 2. Regnum Cottii	44-47
10-14 3. Alpes Graiae	48-50
15-19 4. Vallis Poenina	51-58
II. GALLIA NARBONENSIS	
Note iii Belgantier (Var)	63
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20 Inscription of Volonne	63-64
21-25 Local, Divine, and Personal Names	66-68
2. Bouches-du-Rhône	
26-29 (with Notes iv-v) Inscriptions of Ventabren, Alleins, Eyguières	69-73

* Microfilm copy of complete manuscript of 238 pages, \$2.98.
Enlargements, 6" x 8", 10¢ per page. Library of Congress
Card Number Mic A 50-70.

30-32 Les Baux	73-74
33-43 (with Notes vi-vii) Inscriptions of Saint-Remy	75-89
44 Inscription of Orgon	90-91
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3. Vaucluse	
45-49 Inscriptions of Saignon, Gargas, Saint-Martin-de-Castillon, Saint-Saturnin-d'Apt, L'Isle-sur-la-Sorgue	95-100
50-55 (with Note viii) Inscriptions of Cavaillon	100-107
56-59 (with Notes ix-xii) Inscriptions of Notre-Dame-de Grozeau, Vaison, Beaumont, Carpentras, Orange, Cadenet, Mont Ventoux	107-118
4. Gard	
60-66 Inscriptions of Redessan, Beaucaire, Collias, Uzès, Collorgues, Montmirat	119-125
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80 Local and Ethnic Names	157-173
81 Modern Local Names	174-188
82 Divine Names	188-191
83 Personal Names	191-197
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As other parts are released the contents will be announced in
Microfilm Abstracts.

